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# PROCEEDINGS

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OF THE

## AMERICAN SOCIETY

OF

## CIVIL ENGINEERS

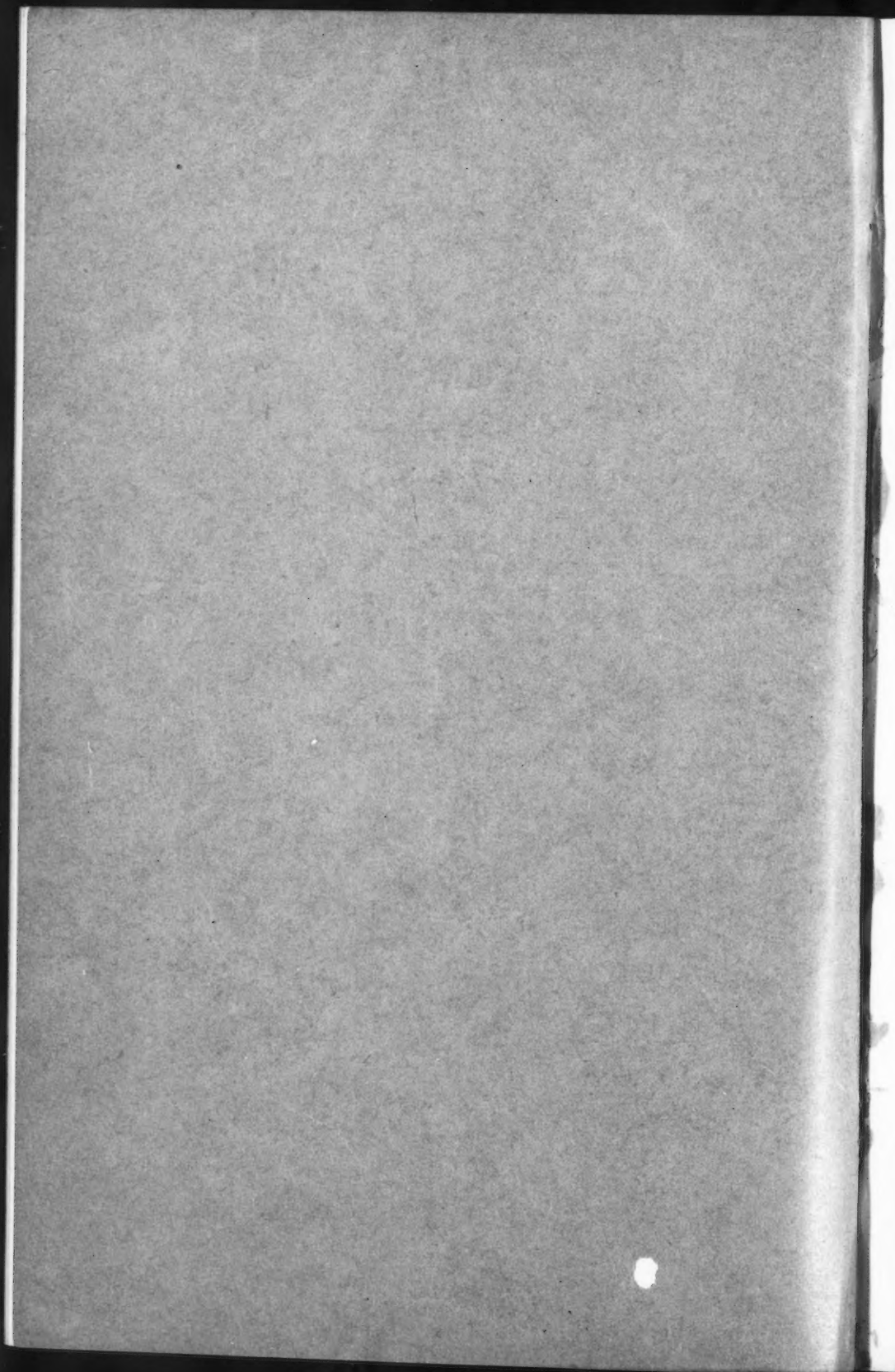
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PROCEEDINGS  
OF THE  
AMERICAN SOCIETY  
OF  
CIVIL ENGINEERS

(INSTITUTED 1852)

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VOL. XLII—No. 6

AUGUST, 1916

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NEW YORK 1916

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# American Society of Civil Engineers

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TO INVESTIGATE CONDITIONS OF EMPLOYMENT OF, AND COMPENSATION OF, CIVIL ENGINEERS: Nelson P. Lewis, S. L. F. Deyo, Dugald C. Jackson, William V. Judson, George W. Tillson, C. F. Loweth, John A. Bensel.

TO CODIFY PRESENT PRACTICE ON THE BEARING VALUE OF SOILS FOR FOUNDATIONS, ETC.: Robert A. Cummings, Edwin Duryea, Jr., E. G. Haines, Allen Hazen, James C. Meem, Walter J. Douglas.

ON A NATIONAL WATER LAW: F. H. Newell, W. C. Hoad, John H. Lewis.

TO REPORT ON STRESSES IN RAILROAD TRACK: A. N. Talbot, A. S. Baldwin, J. B. Berry, G. H. Bremner, John Brunner, W. J. Burton, Charles S. Churchill, W. C. Cushing, Robert W. Hunt, George W. Kittredge, Paul M. LaBach, C. G. E. Larsson, G. J. Ray, Albert F. Reichmann, H. R. Safford, F. E. Turneure, J. E. Willoughby.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

TELEPHONE NUMBER.....1446 Circle.

CABLE ADDRESS....."Ceas, New York."

## AMERICAN SOCIETY OF CIVIL ENGINEERS

INSTITUTED 1852

## PROCEEDINGS

This Society is not responsible for any statement made or opinion expressed  
in its publications.

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### MINUTES OF MEETINGS OF THE SOCIETY

**May 17th, 1916.**—The meeting was called to order at 8.30 P. M.; Vice-President Alfred Craven in the chair; Assistant Secretary T. J. McMinn, acting as Secretary; and present, also, 113 members and 19 guests.

The Assistant Secretary announced the death, on May 16th, 1916, of Elmer Lawrence Corthell, President of the Society. Dr. Corthell was elected a Member, September 2d, 1874, served as Vice-President in 1889, 1893, and 1894, and was elected President, January 19th, 1916.

The following telegram was read:

"Washington Branch sends deep regrets on death of President Corthell. His valuable works and writings are full of instruction to

the Profession, and his broad and honorable services will remain an inspiration to younger engineers for all time.

"ARTHUR P. DAVIS,  
"President, Washington Branch."

The following motion, offered by A. C. Humphreys, M. Am. Soc. C. E., was unanimously adopted:

"As a mark of profound respect and in recognition of the great loss which this Society, the Engineering Profession, and the Country has sustained in the death of our President, Elmer L. Corthell, it is moved that, without transacting any business, we do now adjourn to a date to be set by the officers."

Adjourned.

**May 24th, 1916.**—The meeting was called to order at 8.30 P. M.; W. A. Cattell, M. Am. Soc. C. E., in the chair; Assistant Secretary T. J. McMinn, acting as Secretary; and present, also, 143 members and 18 guests.

H. de B. Parsons, M. Am. Soc. C. E., addressed the meeting on the subject "Engineering Fallacies", illustrating his remarks with lantern slides.

The Assistant Secretary read the following letter:

MAY 2ND, 1916.

"AMERICAN SOCIETY OF CIVIL ENGINEERS,  
MR. CHARLES WARREN HUNT, *Secretary*,  
"220 West 57th Street,  
"New York City.

"DEAR SIR:

"The National Guard of New York have inaugurated a campaign to obtain 3 000 recruits during the month of May, and as the Commanding Officer of the only organization of engineer troops in the State, I ask the co-operation and assistance of the American Society of Civil Engineers towards increasing the number of technically qualified men in this command.

"The armory is at 168th Street and Ft. Washington Avenue, Manhattan, where information can be obtained on Monday, Thursday and Friday evenings.

"I would thank you if you would make suitable announcement of this at your next meeting and post same on your bulletin board.

"Very respectfully,

"E. W. VAN C. LUCAS,

"Lt.-Col., Commanding Corps of  
Engineers, N. G. N. Y."

E. F. Robinson, Assoc. M. Am. Soc. C. E., addressed the meeting on the subject of recruiting engineers in the National Guard.

The Assistant Secretary announced the following deaths:

CLOUD CLIFFORD CONKLING, of Buffalo, N. Y., elected Member, January 4th, 1905; died May 8th, 1916.



FREDERIC CHARLES KUNZ, of Philadelphia, Pa., elected Associate Member, February 6th, 1895; Member, December 7th, 1898; died May 3d, 1916.

THEODORE HALL MCKENZIE, of Hartford, Conn., elected Member, September 7th, 1881; died May 3d, 1916.

HENRY ROHWER, of St. Louis, Mo., elected Member, April 1st, 1903; died May 4th 1916.

Adjourned.

**June 7th, 1916.**—The meeting was called to order at 8.30 P. M.; T. Kennard Thomson, M. Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 85 members and 16 guests.

The minutes of the meetings of April 19th and May 3d, 1916, were approved as printed in *Proceedings* for May, 1916.

A paper by Elliott J. Dent, M. Am. Soc. C. E., entitled "The Preservation of Sandy Beaches in the Vicinity of New York City," was presented by the Secretary, who also read communications on the subject from Messrs. L. M. Haupt, Charles H. Higgins, and Allen Hoar.

The paper was discussed by Messrs. John C. Trautwine, Jr., A. W. Buel, and F. W. Schwiers.

A paper by R. C. Carpenter, M. Am. Soc. C. E., entitled "The Properties of Balsa Wood (*Ochroma Lagopus*)," was presented by the author, who illustrated his remarks with lantern slides and exhibited specimens of balsa wood and articles manufactured from it.

The paper was discussed by Messrs. Leonard M. Cox, A. P. Lundin, and the author.

The Secretary announced the election of the following candidates on May 31st, 1916:

#### AS MEMBERS

WILLIAM EDWIN BROWN, Brooklyn, N. Y.  
AARON MOULTON BURT, St. Paul, Minn.  
FRANCIS FAIR GILLEN, Washington, D. C.  
WILLIAM IGNATIUS KLEIN, Kansas City, Mo.  
HARRY CHARLES LOTHHOLZ, Chicago, Ill.  
ROBERT SPINK REYNOLDS, New Haven, Conn.  
LINDLEY MARSHALL RICE, Seattle, Wash.  
WALTER ADAM SHAW, Chicago, Ill.  
SIMON WEINBERG TARR, Duluth, Minn.

#### AS ASSOCIATE MEMBERS

ORSINO PAUL ALLEE, Kansas City, Mo.  
FRANK JOSEPH BLAIR, Jr., State College, Pa.  
ARTHUR FREDERICK BLASER, Cleveland, Ohio

JOHN BOLDT, Cleveland, Ohio  
FRED MELVIN BROWN, Bozeman, Mont.  
HARRIS DANIEL BUCKWALTER, Harrisburg, Pa.  
WILLIAM VICTOR BURNELL, Houston, Tex.  
EDWARD SHERMAN CHASE, Albany, N. Y.  
JAMES HARLAN CISSEL, Ann Arbor, Mich.  
ROBERT ALLEN CONARD, Jacksonville, Fla.  
FREDERICK WILLIAM COTTRELL, Delta, Utah  
HAROLD JOSEPH CROOKES, New York City  
FRANK HILL DAVIS, Tuscaloosa, Ala.  
WILBUR EARLE FERGUSON, Hastings-on-Hudson, N. Y.  
ALEXANDER SYLVESTER FORSTER, Toledo, Ohio  
WALTER LINDER FOSTER, Sandpoint, Idaho  
FREDERICK HERSTON FRANKLAND, Lake Charles, La.  
FORREST FAYE FRAZIER, Manhattan, Kans.  
GEORGE HAGBART GUERDRUM, Christiania, Norway  
FRANK DEMETRIUS HAYDEN, Seattle, Wash.  
ROBERT WILLIAM HEERLEIN, Pittsburgh, Pa.  
FREDERICK CHARLES HINGSBURG, New Orleans, La.  
CHARLES ANTHONY HOCHENEDEL, Fremont, Ohio  
JAMES HUMPHRY, Jr., Springfield, Mass.  
HARRY GRIFFITH HUNTER, Kansas City, Mo.  
GEORGE AUGUSTUS JESSOP, York, Pa.  
ZED WILBER KENT, Canton, Ohio  
MARK CHAMPION KRAUSE, Williamsport, Pa.  
HERBERT LAWRENCE LUTHER, Leavenworth, Kans.  
HENRY MANLEY, Jr., Elmhurst, N. Y.  
ROY EVERETT MILLER, Seattle, Wash.  
WILLIAM FRANKLIN MILLER, Philadelphia, Pa.  
CHARLES ELIAS MOLLARD, Chicago, Ill.  
ROBERT HENRY MOTH, Cambridge, Ohio  
ROBERT RUDOLPH PANZER, Cincinnati, Ohio  
LOUIS RAY PARMELEE, Helena, Ark.  
HAROLD FRANK PARSONS, Huntington, N. Y.  
WALLACE EMERY PARSONS, Portland, Me.  
ARCHIBALD FREDERICK PARTRIDGE, Mildura, Victoria, Australia  
LAURENCE PATTERSON, Yonkers, N. Y.  
ARTHUR LEONARD PAULS, Boise, Idaho  
HECTOR SOMERVILLE PHILIPS, Toronto, Ont., Canada  
ASTLEY BLOXAM PURTON, Salt Lake City, Utah  
HARRISON GEORGE ROBY, Alpena, Mich.  
CHARLES FREEMAN ROHDE, Brooklyn, N. Y.  
WILKIE CLAIBORNE ROHR, Charlotte, N. C.  
HERBERT MILTON ROUSE, Calexico, Cal.

LEOPOLD MAURICE SANDSTEIN, New York City  
ARTHUR CHARLES SANDSTROM, Redwood City, Cal.  
ROY HOPKINS SHOEMAKER, Manila, Philippine Islands  
SCHUYLER MORTON SMITH, St. Louis, Mo.  
ARTHUR EMERSON SORTORE, Pittsburgh, Pa.  
BURR MANLOW STARK, Montclair, N. J.  
WILLIAM STUART TAIT, Lemont, Ill.  
SAMUEL LOCKE THOMSEN, Toledo, Ohio  
JOHN EDWARD STIRLING THORPE, Whitney, N. C.  
STARR TRUSCOTT, Cristobal, Canal Zone, Panama  
WARREN WILLIAM UPSON, Hartford, Conn.  
ANDREW VOGEL, Boston, Mass.  
FRANK ALANSON WALTON, Lansing, Mich.  
ERNEST JUDSON WAUGH, Benton, Cal.  
MAX WERTHEIMER, Cleveland, Ohio  
WALTER AUSTIN WHEELER, Kansas City, Mo.  
FRANK WALLACE WHITLOW, Milwaukee, Wis.  
ALBERT LOUIS WILCOX, San Francisco, Cal.

## AS ASSOCIATE

ELMER EARL MOOTS, Tucson, Ariz.

## AS JUNIORS

RAY WILLIAM BERDEAU, Paraiso, Canal Zone, Panama  
JAY CASSIUS CANNEY, Seattle, Wash.  
WILLIAM EDWARD FITZGERALD, New Brunswick, N. J.  
FREDERICK HENRY GROSS, White Plains, N. Y.  
DAHYABHAI BALABHAI KORA, Gondal, India  
LOUIS J. LARSON, Champaign, Ill.  
RAYMOND MATTHEW, State College, N. Mex.  
HENRY CONRAD NEFF, Adams, Mass.  
JOHN ROBERT O'DONNELL, Brooklyn, N. Y.  
WILLIAM SING-CHONG PUNG, Cushing, Okla.  
ISADORE MENDELSON SOMMER, San Francisco, Cal.  
FRANK JAMES SOUTAR, Sioux City, Iowa  
WILLIAM EDWARD STANLEY, West Lafayette, Ind.  
ISAAC YOST STAUFFER, Batavia, Java  
CLEMENT F. WAITE, Underwood, Wash.  
LOUIS SHEMALE YOUNGLING, New York City

The Secretary announced the transfer of the following candidates on May 31st, 1916:

## FROM ASSOCIATE MEMBER TO MEMBER

PHILIP LEE BUSH, San Francisco, Cal.  
CLYDE GREYSON CONLEY, Mt. Vernon, Ohio

DONALD DERICKSON, New Orleans, La.  
THEODORE GREEN, Buffalo, N. Y.  
WALTER GLADDEN HUNTER, Stockton, Cal.  
HENRY BURGER SAUERMAN, Chicago, Ill.

FROM JUNIOR TO ASSOCIATE MEMBER

THOMAS ABBOTT BALDWIN, Memphis, Tenn.  
CLARENCE MYERS BATES, San Francisco, Cal.  
WALLACE LAIRD CADWALLADER, New York City  
WILLIAM GREENFIELD CORLETT, Oakland, Cal.  
ORVILLE LAMONT ELTINGE, Kansas City, Mo.  
LLOYD HARRISON FAIDLEY, St. Louis, Mo.  
RUSSELL PLATT HASTINGS, Whittier, Cal.  
LEON COHEN HEILBRONNER, Utica, N. Y.  
KIKUMATSU HIRAI, New York City  
LEON DAVID HOWLAND, LaGrande, Ore.  
IRVING VAN ARNAM HUIE, New York City  
ALBERT CARL KAESTNER, New York City  
HUGH AMBLOSE KELLY, Jersey City, N. J.  
LLOYD McENTIRE, Trenton, N. J.  
HAROLD EDMUND MILLER, Providence, R. I.  
CHARLES SIESEL RINDSFOOS, New York City  
BURKE BROCKWAY ROBERTS, Cleveland, Ohio  
JOHN HENRY SPENGLER, Richmond, Va.  
RALPH BENJAMIN WILEY, West Lafayette, Ind.

The Secretary announced the following deaths:

AMORY COFFIN, of Phoenixville, Pa., elected Member, March 3d, 1875; died June 5th, 1916.

DAVID WEST CUNNINGHAM, of Montrose, Cal., elected Member, May 7th, 1873; died May 10th, 1916.

HENRY FLOY, of New York City, elected Member, June 6th, 1911; died May 5th, 1916.

JAMES VINCENT ROCKWELL, of Pensacola, Fla., elected Junior, April 3d, 1900; Associate Member, February 4th, 1903; Member, November 5th, 1907; died May 24th, 1916.

CHARLES SOOYSMITH, of New York City, elected Member, May 5th, 1886; died June 1st, 1916.

JAMES JEROME HILL, of St. Paul, Minn., elected Fellow, January 10th, 1889; died May 29th, 1916.

Adjourned.



**FORTY-EIGHTH ANNUAL CONVENTION,  
HELD IN PITTSBURGH, PA., JUNE 27th-30th, 1916**

**FIRST SESSION \***

**Tuesday, June 27th, 1916.**—The meeting was called to order in the William Penn Hotel at 10 A. M.; George S. Davison, M. Am. Soc. C. E., Chairman of the Local Committee of Arrangements, presiding; Chas. Warren Hunt, Secretary; and present, also, about 350 members and guests.

Mr. Davison introduced the Hon. H. M. Irons and the Hon. John A. Brashear, who addressed the meeting and welcomed the members to the City of Pittsburgh. Samuel M. Gray, M. Am. Soc. C. E., and Clemens Herschel, President, Am. Soc. C. E., also addressed the meeting.

The President delivered the Annual Address.†

Adjourned.

**SECOND SESSION—BUSINESS MEETING ‡**

**Tuesday, June 27th, 1916.**—The meeting was called to order at 2 P. M.; President Clemens Herschel in the chair; Chas. Warren Hunt, Secretary; and present, also, about 100 members.

The Secretary presented a report on the suggestions of members as to the time and place for holding the Annual Convention of 1917.§

On motion, duly seconded, the matter of the selection of the time and place for holding the next Annual Convention was referred to the Board of Direction, with power.

The Secretary stated that the only report expected from any of the Special Committees was that from the Special Committee on Concrete and Reinforced Concrete, but that none had been received.

It was moved and seconded that the Special Committee on Concrete and Reinforced Concrete be discharged. After discussion it was moved in amendment that the matter be laid on the table. The amendment, being duly seconded, was carried.

The following resolution, offered by John A. Ockerson, Past-President, Am. Soc. C. E., was adopted unanimously:

"We greatly appreciate the cordial welcome extended to us by the City of Pittsburgh through its official representatives; and while the interval between our visits has been a long one, we have watched with interest and pride the rapid development of one of the great industrial centers of the world.

"We congratulate the city particularly on its galaxy of great captains of industry, who have contributed so much to the develop-

\* For the Report in full of this meeting, see page 418.

† See page 835 of Papers and Discussions.

‡ For the Report in full of the Business Meeting, see page 431.

§ See page 431.

ment and progress of our whole country, and we look for even greater achievements in the future.

"To the local members of our Society, and their associates, one and all, we extend our hearty thanks for the generous provisions made for our entertainment and instruction during the Forty-eighth Annual Convention.

"We trust that we may again have the privilege and pleasure of enjoying the hospitality of this progressive city."

The following resolution, offered by George F. Swain, Past-President, Am. Soc. C. E., on behalf of a Committee of the Board of Direction composed of Past-President Ockerson, Past-President McDonald, and himself, was adopted unanimously:

*"Whereas:* It has pleased the Almighty, in His Infinite Wisdom, to remove from the scene of his earthly labors, Elmer Lawrence Corthell, President of the American Society of Civil Engineers; be it

*"Resolved:* That the members of the Society, in Annual Convention assembled, express their grief at the loss of so distinguished an Engineer and so lovable a Man, and their admiration for his many noble qualities of heart and mind. They are thankful that he was granted a life so long, so fruitful for the Profession and for Mankind; with pride and pleasant memories they testify to his eminence as an engineer, his enthusiasm for the best interests of the Profession, his sterling character as a man, his unswerving loyalty as a friend. With saddened hearts they deplore his loss, and extend their deepest sympathy to the family so heavily bereaved. With trust and faith they resign themselves to the will of Him who doeth all things for the best.

*"Resolved:* That these resolutions be transmitted to his family, and that a copy thereof be spread upon the records of the Society."

William N. Brown, M. Am. Soc. C. E., called attention to the matter of Government competition in engineering along certain lines, thus depriving engineers of employment.

The Secretary stated that, in reference to at least one of the Government departments, the matter had been referred to the President of the Society, but that nothing definite had been established as yet.

No action was taken.

The Secretary reported the result of the ballots on the proposed movement of the Society Headquarters from 57th Street to 39th Street, New York City.\*

The Secretary announced the election, by the Board of Direction on June 23d and 24th, 1916, of 10 Members, 29 Associate Members, and 13 Juniors, and the transfer of 9 Juniors to the grade of Associate Member, and 18 Associate Members to the grade of Member.†

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\* See page 458.

† See page 411.

The Secretary read a letter from Preston S. Millar, Chairman of the Administrative Committee of the Illuminating Engineering Lecture Course, announcing a series of lectures on illuminating engineering to take place in Philadelphia, Pa., on September 21st to 28th, 1916.

The Secretary announced the following death:

CHARLES HOPKINS CARTLIDGE, of Chicago, Ill., elected Member, May 4th, 1904; died June 14th, 1916.

George S. Davison, M. Am. Soc. C. E., Chairman of the Local Committee of Arrangements, made some additional announcements relating to the excursions and entertainments.

On motion, duly seconded, the Board of Direction was requested to frame suitable resolutions of thanks for the courtesies tendered by the City of Pittsburgh and the local members of the Society.

Onward Bates, Past-President, Am. Soc. C. E., explained the status of the work connected with the proposed memorial to the late Alfred Noble, Past-President, Am. Soc. C. E.

Adjourned.

#### ELECTIONS AND TRANSFERS BY THE BOARD OF DIRECTION, JUNE 23d-24th, 1916

##### ELECTED AS MEMBERS

JAMES EDWARD CARROLL, St. Paul, Minn.  
FRANCIS LEE CASTLEMAN, Pencoyd, Pa.  
NATHAN RANDALL ELLIS, San Francisco, Cal.  
EUGENE HAMILTON HEALD, Chicago, Ill.  
ELMER KIRKPATRICK HILES, Pittsburgh, Pa.  
EDWARD JOSEPH NOONAN, Chicago, Ill.  
AUGUSTUS LYON PHILLIPS, Philadelphia, Pa.  
WILLIAM HERBERT VANCE, Stamps, Ark.  
THOMAS ROBERT JOHN WARD, Lahore, Punjab, India  
VICTOR WINDETT, Chicago, Ill.

##### ELECTED AS ASSOCIATE MEMBERS

JOHN ROBERT BAYLIS, Jackson, Miss.  
JOHN HENRY CHANDLER, Bartlesville, Okla.  
LUTHER THOMAS FAWCETT, Youngstown, Ohio  
STANLEY HOWARD FRAME, Calgary, Alberta, Canada  
FRANK RAYMOND GOODMAN, Prescott, Ariz.  
JOHN GUINOTTE, Seattle, Wash.  
JAMES HENDRICKS HALLETT, Jacksonville, Fla.  
CHARLES ARTHUR HASKINS, Lawrence, Kans.  
FREEMAN REGINALD HEWETT, Ritzville, Wash.  
CHARLES MILTON HIESIGER, New York City

CHARLES KAAPKE HORTON, Houston, Tex.  
MURRAY LEE HUTTON, Burlington, Iowa  
ALBERTO ANGEL IBARGUEN y Pi, Pinar del Rio, Cuba  
JOSÉ MARIA IBARRA CEREZO, Caracas, Venezuela  
FREDERICK TYLER LAWTON, Brooklyn, N. Y.  
ALONZO CHURCH LEE, Florence, Ala.  
JOHN KILBY McGRATH, Baltimore, Md.  
FREDERICK MEISTER, Hoboken, N. J.  
BENJAMIN FRANKLIN MILLER, Jr., Meadville, Pa.  
HAROLD BROWN MILLER, Pittsburgh, Pa.  
CARL HILDER NORDELL, Milwaukee, Wis.  
CLARENCE WILLARD POST, Albany, N. Y.  
CARL ROY RANKIN, Groveland, Cal.  
JULIUS JENNIS SORENSON, Cuyamel, Honduras  
JAMES ARTHUR SOURWINE, San Bernardino, Cal.  
HENRY DANIELS STOWE, Philadelphia, Pa.  
FRANCISCO TEIXEIRA DA SILVA TELLES, Santos, Brazil  
JOHN JAY VANDEMOER, Loma, Colo.  
OTTO WOLPERT, New York City

## ELECTED AS JUNIORS

GUY ATKINSON, New York City  
ROY PRENTICE BISHOP, Brooklyn, Iowa  
ARTHUR GRAY BUTLER, Louisville, Ky.  
HARRY FOSTER FERGUSON, Urbana, Ill.  
JOHN LYLE GREACEN, Brooklyn, N. Y.  
JOHN MILTON HEFFELFINGER, Jr., Columbus, Ohio  
PAUL LOVERIDGE HESLOP, Memphis, Tenn.  
WILLIAM MORAGNE HUSSON, Jacksonville, Fla.  
HARRY EDWARD JONES, Allentown, Pa.  
JOSEPH LOUIS LOIDA, St. Louis, Mo.  
HENDRIX GILBERT LYTLE, Louisville, Ky.  
ALLEN PIERCE RICHMOND, Central Aguirre, Porto Rico  
ARTHUR PETER VON DEESTEN, Brooklyn, N. Y.

## TRANSFERRED FROM ASSOCIATE MEMBER TO MEMBER

WALTER HENRY ALLEN, Chicago, Ill.  
ROBERT EDMUND ANDREWS, Bay City, Mich.  
GEORGE SAFFORD BEAL, Harrisburg, Pa.  
JAMES WARTELE BILLINGSLEY, New Orleans, La.  
PAUL DARWIN COOK, Sioux City, Iowa  
HARRY JAMES COWIE, Niagara Falls, N. Y.  
MALCOLM ELLIOTT, Louisville, Ky.  
WALTER LEWIS FITZGERALD, Philadelphia, Pa.  
DANIEL WINGERD GROSS, Wilmington, N. C.



JOSEPH FREDERICK JACKSON, New Haven, Conn.  
 FRANK PERRY LARMON, Utica, N. Y.  
 STANLEY ALFRED MILLER, Paducah, Ky.  
 CYRUS EDWARD MINOR, Chicago, Ill.  
 JOHN LYNCH O'HEARN, Oklahoma City, Okla.  
 HORACE PATTON RAMEY, Chicago, Ill.  
 DANA WATKINS ROBBINS, Utica, N. Y.  
 NED HENSEL SAYFORD, Memphis, Tenn.  
 GEORGE AUSTIN SHERRON, Norwalk, Conn.

TRANSFERRED FROM JUNIOR TO ASSOCIATE MEMBER

JAMES BUCKLEY BLACK, St. Louis, Mo.  
 HOWARD FRANKLIN BRONSON, Harrisburg, Pa.  
 FRANK EARLE DODGE, Hudson, N. Y.  
 EDWARD MURRAY FROST, Worcester, Mass.  
 LAURANCE HASTINGS HART, Buffalo, N. Y.  
 SOLON HERZIG, New York City  
 ARTHUR ANTHONY McLAREN, Cedars, Que., Canada.  
 HERBERT MALCOLM PIRNIE, Springfield, Mass.  
 GLENN BARTON WOODRUFF, South Bethlehem, Pa.

## OF THE BOARD OF DIRECTION

(Abstract)

**June 23d, 1916.**—The Board met at 10 A. M., at the William Penn Hotel, Pittsburgh, Pa., at the time of the Annual Convention, as required by the Constitution; President Herschel in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bontecou, Bush, Cooley, Crocker, Davies, Duryea, Endicott, Fuller, Haskell, Hawley, Jonah, Keefer, Khuen, McDonald, Marx, Montfort, Ockerson, Ricketts, Swain, and Tuttle.

The death of Elmer Lawrence Corthell, President, on May 16th, 1916, was reported, and it was recorded that Clemens Herschel, the senior Vice-President, became President to fill the unexpired term, and Director Richard Montfort, the senior Director, became Vice-President to fill the unexpired term of Mr. Herschel.

Isham Randolph, M. Am. Soc. C. E., was unanimously chosen a Director to fill the unexpired term of Richard Montfort.

\*Resolutions for presentation to the Business Meeting of the Annual Convention, and to be engrossed and forwarded to Mrs. Corthell, were authorized.

The following resolution was adopted:

*"Resolved:* That it is the sense of this Board that any officer succeeding to the unexpired term of any office occupies the same position as if elected by the Society to that office."

Mr. Davies, Chairman of the Committee on Special Committees, presented the following Report, which was received and placed on file:

**"Report of Committee on Special Committees**

**"New York, May 15th, 1916.**

**"BOARD OF DIRECTION,**

**"American Society of Civil Engineers,**

**"220 West 57th Street, City.**

"DEAR SIRs: In a report of the undersigned, your Committee on Special Committees, dated March 13th, 1916, presented to the Board of Direction on April 18th, 1916, there was contained a recommendation, in relation to the Committee on A National Water Law, that this Committee should be re-organized.

"Discussion of this subject referred the question of further investigation back to this Committee, and we now beg to report that we have made further investigation as to the work of this Committee, and recommend as follows:

"We requested Professor F. H. Newell, Chairman of this Special Committee, to advise us whether he felt that any work of permanent advantage could be accomplished by his Special Committee on National Water Laws, and in reply thereto Professor Newell states that

\* See page 445.

'in his opinion results of large and permanent value will flow from the work of this Special Committee and that it is highly desirable that it be continued with perhaps fewer members'. Professor Newell goes into considerable detail in respect to the advantages of the work of this Special Committee.

"In the meanwhile this Committee took the liberty of communicating with the American Bar Association, and requested the American Bar Association to advise whether they considered that the Special Committee of the American Society of Civil Engineers was likely to be able to accomplish results which we had been given to understand the American Bar Association had failed in attaining, in connection with the study of A National Water Law. The American Bar Association referred this matter to Mr. Rome G. Brown, of Minneapolis, from whom we have received a valuable and instructive communication, the substance of which is summed up in the following:

"For this reason it would seem to me that the Special Committee of your Society on this subject should not be terminated, but that your Society should appreciate the situation and should make further efforts in this matter. It should, it seems to me, see to it that its Special Committee on this subject is composed of men who are active, interested and informed, and that such Committee should co-operate in the work in Washington in promotion of these remedial statutes.'

"It would seem to me that your Society could do most effective work by retaining this Special Committee and arranging for a more active co-operation in the work that is already being done.'

"Mr. Brown has also referred us to another member of the American Bar Association, who has made a particular study of this work and can give us further information. We find, however, that this gentleman is in the far West and is not likely to return East for some little time; but, in our opinion, such additional information as we can obtain will only strengthen us in our recommendation, that the Special Committee of the Society on A National Water Law should immediately be re-organized; that the entire present Committee as now constituted should be retired and that a new Committee be appointed consisting of Prof. F. H. Newell, as Chairman, with Mr. W. C. Hoad and Mr. John H. Lewis, as the other members thereof.

"This personnel is in accordance with the request of Professor Newell. We then recommend that the Board should give the fullest support to Prof. Newell, with this reconstituted Committee, to give the Committee every opportunity to prove its value and usefulness.

"We further recommend that as we cannot find any value whatsoever to the Society by the co-operation of the Special Committee on Floods and Flood Prevention with the Special Committee on A National Water Law, that the Special Committee on Floods and Flood Prevention should be terminated, in accordance with the request at the last Annual Meeting by the Chairman, Col. Townsend, as we fail to find any benefit or advantage in the co-operation of these two committees, and Col. Townsend's Committee has already tendered its final report.

"We beg to submit this with the request that the Executive Committee of the Board should act on this in advance of the next regular meeting of the Board of Direction.

"Respectfully submitted,

"J. VIPOND DAVIES, *Chairman*,

"VIRGIL G. BOGUE,

"LINCOLN BUSH."

The following resolutions were adopted:

"*Resolved*: That the Special Committee on A National Water Law be re-organized to consist of F. H. Newell, Chairman, W. C. Hoad, and John H. Lewis."

"*Resolved*: That the life of the Special Committee on Floods and Flood Prevention be terminated in accordance with the request of that Committee made through its Chairman, Col. Townsend, to the Annual Meeting in January, 1916."

The Secretary reported that through Director J. V. Davies \$2 500 had been received from the Bethlehem Steel Company to be applied to the work of the Special Committees on Stresses in Railroad Track, and on Steel Columns and Struts.

\*The Secretary presented the Report of the Tellers on the Canvass of Ballots on Proposed Movement of Society Headquarters, dated June 15th, 1916.

Resolutions were adopted for the carrying out of the expressed will of the membership of the Society in this matter.†

The Secretary reported that Messrs. George F. Swain and Stacy B. Opdyke, Jr., had been appointed as representatives of this Society on a Joint Committee of the four National Engineering Societies to prepare a report upon the advisability of the adoption of the Metric System as the practical standard in Engineering.

The following resolution was adopted:

"*Resolved*: That it is the sense of this Board that the President is a member of all Committees of the Society except the Nominating Committee."

The Secretary was instructed to call the attention of all Special Committees to this action.

A final appropriation of \$3 240 to pay this Society's share of the expense of the International Engineering Congress was made.‡

H. R. Safford, M. Am. Soc. C. E., was appointed to take the place of William McNab, M. Am. Soc. C. E., on the Joint Committee on Stresses in Railroad Track, Mr. McNab having resigned as a member of the Committee.

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\* See page 458.

† See page 459.

‡ The original amount underwritten by this Society as its share of these expenses was \$9 000; 86% of this, or \$7 740, has been called for, and has been paid.



The Constitution of the District of Columbia Association of Members recently formed was approved.

The Constitution of the Illinois Association of Members recently form was approved.

The Constitution of the Utah Association of Members recently formed was approved.

Ballots for membership were canvassed, resulting in the election of 10 Members, 29 Associate Members, 13 Juniors, and the transfer of 9 Juniors to the grade of Associate Member.

Eighteen Associate Members were transferred to the grade of Member.

Applications were considered and other routine business transacted.

The resignations of 1 Associate Member and 2 Juniors were accepted.

Adjourned.

**June 24th, 1916.**—The Board reconvened at the William Penn Hotel, Pittsburgh, Pa.; President Herschel in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bontecou, Bush, Cooley, Crocker, Davies, Duryea, Endicott, Fuller, Haskell, Hawley, Jonah, Keefer, Khuen, McDonald, Marx, Montfort, Ockerson, Swain, and Tuttle.

A Report from the Membership Committee was received and acted upon.

Applications were considered and other routine business transacted.

Adjourned.

**FORTY-EIGHTH ANNUAL CONVENTION,  
HELD IN PITTSBURGH, PA., JUNE 27th-30th, 1916**

**FIRST SESSION**

**Tuesday, June 27th, 1916.**—The first session of the Convention was opened in the Ball Room of the William Penn Hotel at 10 A. M.; George S. Davison, M. Am. Soc. C. E., Chairman of the Local Committee of Arrangements in the chair; Charles Warren Hunt, Secretary; and present, also, about 350 members and guests.

**THE CHAIRMAN.**—The Forty-eighth Annual Convention of the American Society of Civil Engineers will now come to order.

Members of the American Society of Civil Engineers: It is forty-one years since last you were here. Forty-one years is a short time as the world goes, but this particular space of time, when measured by the achievements of the scientist and the engineer, marks a distinctive age of the world.

Those of you who were present on the other occasion, journeyed hither in wooden railway coaches; to-day you traveled in an all-steel train, a very recent addition to life protective measures; then you rode from the railway station to your hotel behind a single or a pair of old dobbins, to-day in a gasoline car, an invention of but fifteen years ago; then you did not convene on the seventeenth floor of the hotel, the tallest building in this city at that time being but six stories high, and that wonderful development of the engineer, the steel skeleton skyscraper being fully ten years in the future; then the human voice could not carry through walls and illimitable space, Graham Bell not having at that time made his telephone practicable; then the voice could not be preserved and reproduced, Edison having not yet made the phonograph a reality; then the most approved method of illumination was the light from a gas flame, it being three years later that incandescent electric lighting became a fact; then the science of aeronautics was confined to "going up in a balloon", it requiring twenty years thereafter for an honored member of this Society, Octave Chanute, first to establish the possibility of automatic equilibrium for air ships, thus creating a new word in the English language, to wit: aviation; then the dirigible torpedo had not been invented, that almost human thing which, coupled with the recently perfected submersible boat, is now the terror of the seas.

What changes has this period wrought upon our Society? Speaking briefly, it has been a time of strenuous growth and continued prosperity for the American Society of Civil Engineers. Then it had a total membership of not more than 400, now there are in its various grades about 8 000. Then it occupied rented quarters on East 20th

Street, New York City, with assets of not more than \$10 000. For nearly nineteen years it has occupied its own property on West 57th Street and is reputed to be worth about \$550 000. It has just voted by an overwhelming majority to dispose of its home, and become a joint occupant with other great Technical Societies, of a building which shall be a National Engineers Headquarters.

It may be interesting information, that, of the membership in 1875, there are but forty-seven now living, and of these but nineteen attended the Seventh Annual Convention, which, by the way, was among the first to be held away from New York City. Your Local Committee of Arrangements sent special invitations to these nineteen survivors for this Convention. Some have answered in person. The others have sent their regrets. As an example to us younger members, of the loyalty we should ever show to our Society, it is fitting we should hear them.

The speaker then read letters from: W. H. Wiley, New York City; Theodore Cooper, New York City; C. S. Maurice, Athens, Pa.; Marshall Morris, Waukesha, Wis.; F. B. Howard, Grosse Ile, Mich.; William Rotch, Boston, Mass.; Franklin C. Prindle, Washington, D. C.; W. D. Pickett, Louisville, Ky.; Joseph P. Davis, Yonkers, N. Y.; J. W. Hill, Cincinnati, Ohio; Charles Macdonald, Trenton, N. J.; J. F. Flagg, Santa Barbara, Cal.; W. H. Burr, New York City; and Robert Fletcher, Hanover, N. H.

This city is proud of the fact that it has furnished four presidents to this great Society: William Milnor Roberts, Max Joseph Becker, William Powell Shinn, and William Metcalf.

Of the present large membership, of which I spoke to you a few moments ago, 2½%, or practically 200 members, are residents of this city. In order to assure you that the citizenry of Pittsburgh is pleased to have you with us, I shall ask Mr. H. M. Irons, of the Legal Department of the City of Pittsburgh, who is here representing his Honor, Mayor Joseph G. Armstrong, to address you.

HON. H. M. IRONS.—Mr. Chairman, Ladies and Gentlemen, and Members of the American Society of Civil Engineers; Mayor Armstrong requested me first to say that he regrets very much his inability to be here this morning, but he has delegated me to say a few words of welcome for him.

After meeting many of the members of this Society, and after looking over this magnificent audience of great and intelligent men who have made the world move and who have wrought wonderful changes in the past 41 years, I know and feel that what Mayor Armstrong has lost in not being here has been to my infinite gain.

After listening to the remarks of the last speaker wherein he told you that through the efforts of science and through the achievements of the civil engineer, most wonderful advancement has been

made, and, when he told you something of the energy and the growth of this wonderful age in which we live, I could not help but think that we might go a step further and say that, since the discovery of this country, since the mind of man was given scope and given a chance to expand, it has produced marvels and wonders in four generations that eclipse and surpass the achievements of more than forty centuries. In four generations, the scientists, the discoverers, the inventors, the engineers, the real kings of the useful, have overcome the procrastinating efforts of time, and have brought about in a large degree the realization of the dream of centuries.

And you, gentlemen, are gallant enough and great enough to know that back of your great accomplishments, that back of your marvelous achievements, that back of all the wonderful things that you have produced stands the sweetheart, the patient wife, and the faithful mother. Back of man's success there is this inspiring influence that buoys him up in the sea of troubles and that drives him on through dangers and difficulties straight to the shining goal.

You, gentlemen, recognize the helpful companionship of your wives, and you herald that recognition to the people of Pittsburgh by bringing your wives and your daughters with you. We are all familiar with that old story of woman's listening to the conversation of the serpent and tempting Adam, and how through his fall man was thereby expelled from the glory of his first estate, but the fact that Adam put the blame upon his wife proves him unworthy of her, and, whether this story be true or not, I do know that the man who possesses the love of a good woman has not lost paradise but carries paradise with him wherever he goes.

Now in the name of the people of Pittsburgh and of all her daughters and her sons, I welcome you with all the cordiality contained in that one word "welcome". It has been 41 years since this Society last visited Pittsburgh, and I feel that we can go back and take up the story of the fellow who had wandered far from home, far from his father's house, and when he realized what he had lost he lifted up his eyes and beheld in dreams the glories of his father's house. So we, like the good father of old, will on this occasion, through the high offices of the City of Pittsburgh and the hospitality of our people, kill for the strangers and visitors within our gates the fatted calf, we will throw upon your shoulders the robe of hospitality, and we will welcome you and make you feel as though you had returned in very truth to the father's house.

It gives me great pleasure to welcome you, gentlemen, because I believe that this is one of the greatest and most widely known societies of the United States of America; one of the most technical, one of the most advanced societies, a society that has worked out and produced much of our present-day civilization. I am informed that wherever

we may go, wherever tunnels are bored through the hills, wherever bridges span the chasm or cathedral spires part the clouds, wherever man is marching in the van of the world's progress and mighty structures are being built, you will find a member of the American Society of Civil Engineers; and I believe it can be truthfully said that the sun in traveling around the globe never sets upon the members of this Society.

You will find that our cultured city possesses all modern improvements. It is a grand old commonwealth, nestling peacefully among the hills of Western Pennsylvania—a sort of glowing ruby of the robe of civilization. Pittsburgh is not progressive to the extent that her people have cast aside humanity and have anointed themselves with hypocrisy. She possesses for the poet, the philosopher, and the student an inexpressible charm. The banners of four nations have waved over her battlements. The French and English contended for the supremacy of this country at old Fort Duquesne. Here conferences with the Indians were held, the termination of which raised the banner of Washington, which still proudly fondles our air.

You must spend some time in sight-seeing. You will be shown many historical places, where great achievements have been wrought, and when you leave us, you will realize that every foot of our city is holy ground. You must visit our libraries and technical institutes, which perpetuate the name of Mr. Carnegie; our wonderful steel works and foundries which proclaim Pittsburgh to be the workshop of the world. By all means take an excursion to our South Hills, and from them look down upon our city at night, with its countless myriads of gleaming lights—one would think that the angels had spilled a basket of stars. The past, with all its glorious achievements, lies spread out before us in epitome. We can proudly boast of our tireless energy and the genius that gilds our name with glory, but we should not forget that what we are is only a prophecy of what we will be in the future, and when you come among us again our dreams will have become realities, and you will behold a more glorious empire than Greece or Rome ever saw.

You will find Pittsburgh just like all ordinary cities. She is bounded on the north by great ambition, on the south by indomitable energy, on the west by magnificent achievements, and on the east by the star of hope.

In welcoming this Society we cannot bestow upon you more laurels than you have won. We cannot honor you as you have honored us with your presence. Your presence among us means more to us than it can ever mean to you. May this meeting for the exchange of sentiments, of thoughts, of methods, of ideas and ideals, prove not only beneficial to you, gentlemen, who take part in the deliberations, but may it redound to the glory of humanity. May your stay among

us be pleasant and profitable, and when you depart and each and all shall go their separate ways, may something gathered here become an evergreen in the wreath of memory.

Before we part I shall recite to you a little poem which is the product of a Pittsburgh mind. It tells something of the truth concerning Pittsburgh, what Pittsburgh has accomplished, what Pittsburgh stands for, and what Pittsburgh wishes to be. It is beautifully expressed as follows:

"I am monarch of all the forges,  
I have solved the riddle of fire,  
The amen of nature and the good of man  
Cometh at my desire.  
I search with the subtle soul of flame  
The heart of the hidden earth,  
And from under my hammers the prophecies of  
The miracle years go forth.  
I am swart with the soot of chimneys,  
I drip with the sweat of toil,  
I quell and quench the savage wastes,  
And I charm the curse from the soil.  
I fling the bridges across the gulfs  
That separate us from the to be,  
And I build the roads of the bannered hosts  
Of crowned humanity."

THE CHAIRMAN.—It has been suggested that the persons sitting in the rear of the hall may not be able to hear the speakers. If that be true, there are plenty of seats up in front.

It is just as unnecessary to introduce some speakers to their audience as it would be to present to each other two old friends; and, though there is a lack of necessity in this particular case, I take great pleasure in introducing to you the first citizen of the State of Pennsylvania, a man who is great in his own simplicity, and in the affection in which he is held by all those who have come under his wonderful influence. He proposes to speak on the relation between science and engineering; and I introduce him to you in the terms that he loves to hear—"Uncle John, here is a fresh batch of nieces and nephews, go to it."

HON. JOHN A. BRASHEAR.—My dear friends—I do not like to say, "Mr. President, Ladies and Gentlemen," because that puts him out of the running, but he is one of the decentest fellows that we have in this town, and we all love him.

The last time I spoke to an audience here, there were about eight hundred gathered in this room, all hard-headed business men, calling themselves the Creditmen's Association. I had a pretty hard time to get out of the hall after I had concluded my address. One of them said, "Look here, my old friend, are you going out and not



shake hands with me?" I replied, "Not if you will shake hands with me." "I want to shake hands with you and tell you that was a dandy address you gave us; but, when I saw on the programme that the Honorable John A. Brashear was to speak, I turned to the gentleman on my left, and said to him, 'Who is this man?' He evidently was a Pittsburgher and knew you and replied, 'Well, he is a celebrated astronomer; one of our greatest men;' and when I looked up on the stage and saw an old white-headed fellow sitting there, do you know what I thought?"—you will excuse me, gentlemen, for giving it to you in his exact language—"I thought what the hell are they going to give us now?"

I suppose he thought I was going to give them a lot of dry old figures that he could not understand, and that nobody else could understand; but I didn't do anything of the kind, and I hope I am not going to perpetrate anything of that sort on you to-day. I am very glad to meet and welcome you all, as did our good, loyal friend the last speaker, to the City of Pittsburgh.

I did not know it, but I was glad to learn that we had a lawyer who had the love of mother and wife and sister down in his heart, and was not afraid to come before you—and there are probably some bachelors here—and speak it right out.

Here is my dear friend from California. He knew when I stood up before the great crowd of mining engineers—and they were half women—and somebody had been telling the story of Adam and the apple; I said that I considered that man Adam the damndest coward that ever was born on the face of the earth, because, when the Lord came around, Adam said, "The woman did tempt me and I did eat." I would have liked to have been there about that time with an old-fashioned shot-gun. "The woman did tempt me"—what do you say, ladies? Wasn't he a cur? They all nod their heads.

This is a city that I love. I have been in it for more than 50 years. I have been associated with some of the men that have done great work in the City of Pittsburgh. I wish to pay a tribute right here to one of those pioneers, as that dear fellow, your Chairman, has been telling us in the letters that he read. I want to pay a tribute to the name of William Thaw, one of the first men that appreciated scientific work in the City of Pittsburgh.

Away back in 1859 the citizens of Pittsburgh got together, a few of them, and raised money for an observatory up on the hill above us. William Thaw was one of its first directors. The first director of that observatory was so proud of his telescope that he would not even let the Board of Trustees look in it without previous arrangement.

However, in 1867, Professor Samuel Pierpont Langley came to the observatory, and—what many of you do not know—there established the first standard time system on a permanent basis—the first

accurate time system that was established in the United States of America, or in any other country, for that matter.

The Harvard Observatory and the United States Naval Observatory had sent out a few desultory messages of the time by the stars, but Langley was the first to establish it; and before a year had passed 5 700 miles of railways—and that was a great many for those days—had the time signal sent out to their stations; and to this day the Allegheny Observatory stands, with its record of accurate time, better perhaps than any other place in the United States, although some of the observatories keep it very accurately—the average error for last year was  $\frac{32}{100}$  of a second—close enough for you to set your watch. For 1914 the average was  $\frac{22}{100}$  of a second, and we worried a good deal about that  $\frac{10}{100}$  of a second.

It was here that Langley began his studies on the sun, and gave to the world probably one of the most unique studies and determinations that have ever been made, that is, he found the reason why you and I can live upon this earth; why the flowers can bloom; why the birds can sing; and the reason why life may be possible upon any other planet in this great universe of God's creation; and I would like to tell you, because you have been talking about aviation, I would like to tell you that one of the saddest half hours of my life was when my dear friend Langley failed in that flight down on the Potomac, and the word was sent out "Langley's machine a failure." When he talked to me at the Smithsonian Institution about his failure, he said "Mr. 'Brazier'"—he always called me 'Brazier'—"my lifework is a failure." I said to him, "Langley, if you had done nothing more than your memorable work to prove the reason and to give us the facts why life is possible on the earth, you have done enough for one man"; but I could not console him, and shortly afterward he took the fatal stroke that ended his dear life, because a wicked newspaper man, who had a grudge against him, sent out that unkind message.

Gentlemen—ladies first—I was with him in all those early researches and also in his work in aviation; and I shall not forget when I received a letter from that magnificent man, Helmholtz, who had gone over the research work of Langley, with duplicate apparatus we had made for him. In that letter Helmholtz said "My dear Mr. Brashear, I have gone over Langley's whole work in relation to the life history of the earth, and I cannot find a single flaw in it"; and some day, when your friend who stands before you—I won't be here—but when the little box that lies in the corner stone of the work-shop on the hill is uncovered, that letter of Helmholtz will be found there. I don't know whether Langley knows anything about it, on the other side, but I think he does, his work had been done so well, and so useful was the record that he made on Observatory Hill in Pittsburgh.

Then Keeler came along. It was he who solved the problem of the motions of the nebulous bodies in the heavens, and gave to the world a physical solution of the character of the rings of Saturn. Laplace had worked it out mathematically, but the solution was not satisfactory, and finally Maxwell came along and proved mathematically that the rings were composed of discrete particles, like meteoric bodies, but it remained for Keeler to solve the problem, and that was done on Observatory Hill above our city.

And you engineers know of the work of that magnificent man, George Westinghouse, what was done in this, our city, and how his work contributed to human knowledge and human betterment, the prophetic and actual saving of untold thousands of American lives.

Friend Davison, I have always liked the name of your Society. There is something back of it. The Civil Engineer puts into his work something that has a human touch that none of the rest seem to have—civil engineers—God bless you!—that is the work that counts in our lifework. I do not care if you build great structures, that you construct the great buildings and bridges that you do, if you have not the word “civil” back of you, you are not “worth a continental.” It is that element that comes into the lives of busy men and makes them great; you must have that element; and I hope that you are every one civil to one another, civil to the ladies—you could not help but be that, for, if you were not, your fellow members would kick you out of the community, and right they would be.

I have had a long experience in this old round world, and in that experience of more than 45 years associated with devotees of science, I have known 180 of the greatest investigators in the world. Two-thirds of them are in heaven now. In the best of these men I have found that element of civility, of kindness, of helpfulness, that counts for a great deal in life's work; indeed, in my humble opinion, no man can be great unless these factors are a part of his make-up.

I do not know whether they are building bridges, studying the stars, or laying out railroads there or not, just so long as they are there, and they will be well taken care of I believe when they get there. I have in my possession a most interesting letter from my dear old friend Prebendary Webb, a great astronomer, a good pious man, an Episcopal minister. We had been studying a crater plain on the moon, where we thought volcanoes were still active—Burt, Webb, and about twenty others were among the students. Before the work was done, Burt died, and Webb wrote me: “My dear Brashear, our friend Burt has gone over to the other side, but I am sure that in going to heaven, if he had his way, he would stop by way of the moon.” I would like to stop that way too, although it is an awfully

cold place, and not a very good place for engineers, or anybody else, for that matter.

How can we differentiate the wonderful work of the scientist with the engineering progress that has been made in more than 50 years. When I look back at what has been done in engineering science, it is wonderful, indeed. Why, bless you, my old-time friend Quincy told me that when he was on the Baltimore Railroad, in the first years of its operation, the trains stopped when it got dark, and when it grew light again they started up. There is nothing like that nowadays, gentlemen.

Two years ago, down in Los Angeles, I got into a flying machine, and went up, and up, and up. As we got away above that beautiful St. Gabriel Valley, I thought, "What hath man wrought," as well as, "What hath God wrought?" and my one wish, when I was sailing around in that pure, clear atmosphere, up there, was that Langley had been sitting by my side. There we were flying nearly 3 000 ft. above the plain, and I was as "happy as a big sunflower," only I wished that Langley had been with me.

These things have all come since my début into this world, and they have all been so closely associated with the advancement of every form of engineering that I do not see how you are going to separate them.

I was at a wonderful meeting of scientific men in Terre Haute, 30 years ago, when they had a gathering of the American Association for the Advancement of Science, and old Dick Thompson, who was Secretary of the Navy under Garfield or some other President whom I cannot now remember, was asked to make a speech. Here is his story: "I don't know what I can tell you scientific men that will be greatly interesting to you, but I will tell you of my association with the electrical telegraph." Then he told us the story of how, in 1844, he was a Member of Congress from that district in Indiana, with two other men who were in Congress from his State. He said:

"We had to ride horseback and stage coach, and when we got to Ohio, where there happened to be a canal, we took passage for part of our journey. Reaching Cumberland, got into a little railroad train and were taken to Philadelphia; and then to New York, for we wanted to see the great city.

"A Member of Congress came across the hallway and said, 'Thompson, there is a man here in New York by the name of Morse, who has an instrument he calls the electric telegraph, and says that he can send a message from Washington to Baltimore in less than two seconds. He wants to ask a subsidy of \$25 000 from Congress to put up the line.'

"I went over the next day. There were several gentlemen standing around the machine. He was tapping on it, and there was a little white ribbon of paper came out, marked with dots and dashes. I could not see very well, but when the gentlemen were gone, I was introduced to Mr. Morse who said to me, 'Mr. Thompson, I want to explain this machine to you.' He told me he had 10 miles of wire through the house, and said, 'I can send a message instantaneously, for you see when I put down my key, the message comes down the wire.' He then said, 'Will you ask me a question, and I will try to answer it?' James K. Polk and Henry Clay were then running for President. Thompson said, 'Do you know what I asked him?' I asked him who would be the next President of the United States. He began tapping the key and at the same time dots and dashes came out on the little ribbon. He picked it up and read to me, 'Henry Clay.' Gentlemen, do you know what I said? 'I don't know a damned thing about your machine, but I like its politics, and I will vote for you.'"

Well, the politics was all right. He voted for the subsidy and Mr. Thompson told us that at the next election he got through by the skin of his teeth, but his colleague was defeated for wasting the public money. Think of it. Now, what could you civil engineers do without the telegraph to-day?

The other day I was down in Washington. I took the receiver of a telephone and put it to my ear. I heard the ticking of a clock 500 miles away. I was in New York on a Sunday afternoon, the 24th of January a year ago, with my friend Alexander Graham Bell, and Mr. Carty, the Engineer of the American Bell Telephone Company. We heard messages across our good country from the Pacific Coast. We listened to Mr. Watson's voice, but it did not carry well. Watson was the first man to hear Mr. Bell's voice over the telephone. However, when Mr. Moore, President of the Panama-Pacific Exposition spoke in the telephone, I heard it almost as plainly as if he were speaking from a local station. And then Mr. Carty told us he would put up a replica of the original apparatus made by Watson for Bell, and said to me: "You go in the other room and we will see what we can get from Omaha and back again?" Dr. Bell talked to me and said, "Brashear, do you hear me?" and over that 3 000 miles of wire, over to Omaha and back again, I heard Bell's voice clearly and answered it, to his delight. There was no relay at Omaha.

When I was a guest of my friend Carty on the Pacific Coast last year, he took me to a private room of the Telephone Company, and I heard a message from New York; and then a megaphone on the telephone at Atlantic City enabled me to hear the dashing of the waves upon the Atlantic Coast, while I was listening out on the



Pacific Coast. What would the civil engineer do without the telephone to-day?

A German for the first time was asked to listen at the telephone, when he heard that his wife was at the other end, at a friend's house. Just as he picked up the telephone and his wife came to it, there was a flash of lightning that knocked him down, and he said "That's her; I know her voice."

There are some of us who may think that pure science and engineering do not have much in common, no interlocking places. Ask my friend Smith, of our University, whom I see in the audience, why he is interested in everything of a scientific character. He is Professor of Engineering at our University; he is dabbling in scientific things all the while.

I was a guest at the meeting of the National Association of Scientific men at Washington about three weeks ago—they are the great moguls and the House of Lords of our scientific men—and had the pleasure of speaking to them about our wonderful National Engineering Societies, of which I believe the Civil Engineers have the greatest number of members and some of the most splendid men who have made this country what it is. I asked them if they would not join forces with these societies. There is no doubt we will get all the National Associations to join forces with us. The thing is coming, and I am here to appeal to you Civil Engineers to hasten the day when there shall be no line of demarcation between applied science, between pure science and engineering. Indeed, engineering is to-day on a higher plane of science than ever before, and the day of empiricism is passed forever. You cannot do anything nowadays without a knowledge of science. You do not do things empirically when you build a bridge. No more guesses at the depth of the bridge girder, or at the strength of the ties. Would you, my friend Taylor, lay out a railway without a little knowledge of the use of the transit? I do not think you would do as the sailor did when the captain left him in charge of the helm, saying, "I want you to keep the ship on that star". When the captain came back from his supper he found that the ship was turned around a number of points. "Didn't I tell you to keep your ship on the star?" The sailor replied, "Captain, I passed that damned star long ago." Taylor does not do things like that. He keeps that old transit of his pointed in the right place.

I have for many years been interested in science; I love it for its own sake. So I want you to get at least a smattering of the sciences outside of that which relates purely to civil engineering. Do you think that it makes this carnation that is colored a very beautiful pink any the less beautiful because we happen to know the reason why it is so? Do you think, when I look at a lovely rose, that it is, any the



less beautiful because I know it sends out certain rays of light to that wonderful structure, the human eye, and makes us see the rose so beautiful? Do you think it is less wonderful when a blind man goes through the conservatory, and smells the wonderful fragrance of the rose, and tells us of its wonderful structure by the delicate touch of his sensitive finger tips? There is beauty in everything. You know the words of the poet Wordsworth:

"A primrose by a river's brim  
A yellow primrose was to him,  
And it was nothing more."

I see beauty in the pebbles they haul in the wagons along the streets to fix the pavements. I see beauty in the cement they mix it with. My friend Dr. King told me that the Indians in the North, when they went to see the wonderful sight of the eclipse, saw nothing so wonderful in the eclipse as when they put the water, "dust", and sand together and made solid stone out of it.

The best beauty of all is this civility, is this friendship, is this affection. You shall find it here in the City of Pittsburgh. The other day at a meeting somebody said, "Whoever loves Uncle John, put up his hands", and every woman in the whole place put her hand up. Don't you think that is awfully nice? Sure it is.

You show helpful affection when you do something for the other fellow. Do not wait for him to do it for you. Do it first. I would like to tell you something of the things we have had done for us in the great City of Pittsburgh, but I believe a good part of it is in our friendship, and we are going to show it to you here.

I don't care whether the Mayor was here to welcome you to-day, or whether you may see him to-morrow and say, "We are going to get another mayor next year", or tell him you want him. We do not care about that. We want you to enjoy yourselves in our beautiful city, in our beautiful park, in our beautiful observatory, in all our beautiful surroundings; and when you see our wonderful mills and factories, carry away the memory that here in Pittsburgh there are some human hearts that beat in sympathy with their fellows, and hope to get them to Heaven and give them a helping hand to get there.

THE CHAIRMAN.—There may be a reluctance (from the large number of regrets that were sent by the 75ers) to test repeatedly the hospitality of Pittsburgh, but I am pleased to say that of the 75ers, there are a few for whom this city has no terrors; I take great pleasure in introducing one of them, Mr. S. M. Gray, of Providence, R. I.

S. M. GRAY, M. AM. Soc. C. E.—Mr. Chairman and Gentlemen of the American Society of Civil Engineers and Ladies, I was surprised when Mr. Davison wrote me that it was 41 years ago since I attended a Convention of the American Society of Civil Engineers in Pitts-

burgh. I well remember it; I well remember the pleasure of it; and I can only say that I hope to be here for 41 years to come, in 1957.

THE CHAIRMAN.—Mr. Gray is not alone among those of our former guests. I take additional pleasure in introducing Mr. Clemens Herschel, who, regardless of his youthful appearance, claims that he was here 41 years ago.

CLEMENS HERSCHEL, PRESIDENT, AM. SOC. C. E.—Ladies, Guests, and Fellow-Members: You have probably noticed, all of you, what good work the Committee of Reception in Pittsburgh is doing for us. Well, in their wisdom, and having seen fit—this being the “City of 57 Varieties”—to call on me, on one such as I, to speak in behalf of those who were here 41 years ago. I will only say that we had a most delightful time then, and I do not question for a moment but that we shall repeat it.

At that time the oil industry was just beginning, and, as one of the sights of the day, they took us up into the mountains somewhere near here, and showed us a pipe line, 1½ in. in diameter, through which oil was pumped about 300 or 400 ft., possibly farther. We saw the Lucy Furnace, supposed then to be the biggest thing out. Andrew Carnegie was there to show it to us; and, from what our Chairman of the Reception Committee has said, you know what progress has been made since then; and what I have been describing was the beginning of some of that progress. I need not expatiate upon it. I am very happy to give my little tribute to 41 years ago.

THE CHAIRMAN.—Your Local Committee has undertaken to place before you in a very simple way the various events of the Convention. The programmes were very late in being delivered at the hotel, but we hope that you will secure copies of them at once, if you do not already have them. Please study them carefully, and indicate at the Information Booth the excursions on which you wish to go.

I want to call particular attention to the trip for the ladies this afternoon. That will occur at 2 o'clock, and the arrangements are in charge of a committee headed by Mr. E. K. Morse as Chairman; also to the dinner dance of this evening.

We hope that you will all be present and enjoy yourselves. The committee in charge of the latter affair is under the leadership of Mr. Khuen. I need not mention the remainder of the programme, as it is self-explanatory.

The time has now come when the President of our Society shall deliver the Annual Address. I, therefore, take occasion again to introduce to you Mr. Clemens Herschel, President of the American Society of Civil Engineers.

The President, Clemens Herschel, then delivered the Annual Address.\*

\* See page 835 of Papers and Discussions.

**THE CHAIRMAN.**—I have been asked to request you all at once to secure your tickets for the dinner dance this evening and for the boat excursion to-morrow, so that the committees in charge of these affairs shall be fully informed of the number for which they must provide. This suggestion is equally important in connection with the automobile trip for Friday. So, at the adjournment of this meeting, those who have not already made their arrangements should go to the Registration Room and attend to these matters.

This meeting now stands adjourned, and the Business Meeting of the Society will convene at 2 o'clock in this room.

### SECOND SESSION, BUSINESS MEETING.

**Tuesday, June 27th, 1916.**—The meeting was called to order at 2 P. M.; President Clemens Herschel in the chair; Charles Warren Hunt, Secretary; and present, also, about 100 members.

**THE PRESIDENT.**—I call this meeting to order. The first subject put down for discussion is the time and place for holding the Forty-ninth Annual Convention. What have you, Mr. Secretary, on that subject.

**THE SECRETARY.**—Mr. President, the first thing to report is a summary of the suggestions that have been received as to the time and place for holding the Annual Convention of 1917.

#### Report of the Secretary on Suggestions as to Time and Place For Holding Annual Convention, 1917

"As to place:

"Total number of suggestions received, 443.

Chicago, Ill.....	60	Washington, D. C.....	9
Detroit, Mich.....	52	Buffalo, N. Y.....	7
Boston, Mass.....	44	Los Angeles, Cal.....	7
New York City.....	23	Minneapolis, Minn.....	6
Denver, Colo.....	17	Philadelphia, Pa.....	6
Kansas City, Mo.....	15	Salt Lake City, Utah.....	6
St. Louis, Mo.....	15	Seattle, Wash.....	6
Atlantic City, N. J.....	13	Asheville, N. C.....	5
Cleveland, Ohio.....	11	Dallas, Tex.....	5
Milwaukee, Wis.....	11	Jacksonville, Fla.....	5
Cincinnati, Ohio.....	10	San Francisco, Cal.....	5
Atlanta, Ga.....	9	Saratoga Springs, N. Y.....	5
New Orleans La.....	9		

"The following received 4 votes: Portland, Ore.

"The following received 3 votes each: Birmingham, Ala., Duluth, Minn., Louisville, Ky., Niagara Falls, N. Y., Omaha, Nebr., Portland, Me., St. Paul, Minn., Spokane, Wash.

"The following received 2 votes each: Baltimore, Md., Butte, Mont., Galveston, Tex., Havana, Cuba, Mackinac Island, Mich., Plattsburg, N. Y., Roanoke, Va., Rochester, N. Y.

"The following received 1 vote each: Alexandria Bay, N. Y., Burlington, Vt., Buenos Aires, Argentine Republic, Calgary, Alberta, Canada, Cape May, N. J., Cooperstown, N. Y., Greenbrier, W. Va., Harrisburg, Pa., Honolulu, Hawaii, Hot Springs, Va., Indianapolis, Ind., Ithaca, N. Y., Lake George, N. Y., Mackinaw, Montgomery, Ala., Montreal, Que., Canada, Newark, N. J., New London, Conn., Panama City, Panama, Pittsburgh, Pa., Quebec, Que., Canada, Quebec Bridge, Richmond, Va., San Diego, Cal., San Jose, Costa Rica, San Juan, Porto Rico, Sault Ste. Marie, Mich., Savannah, Ga., Syracuse, N. Y., Toronto, Ont., Canada, Vicksburg, Miss., White Sulphur Springs, Winnipeg, Man., Canada, Some point in Florida, on Chartered Steamer, Buffalo to Duluth, Steamer on Great Lakes, Some Summer Resort, Rotation by Director Districts.

"Suggestions as to time:

"Total number of suggestions received, 390.

February .....	6	July .....	31
March .....	2	August .....	7
April .....	8	September .....	11
May .....	26	October .....	5
June .....	259	November .....	3

January or February.....	1	October or November.....	2
April or May.....	2	Early Summer.....	2
May or June.....	2	Winter.....	2
May or October.....	1	Annual Rose Festival (In con-	
June or July.....	11	nection with Portland, Ore.,	
June, July, or August.....	1	as the place).....	1
June or September.....	1	Some summer month.....	1
June or October.....	1	Any time.....	1
July, August, or September...	1	Fair weather.....	1
September or October.....	1		

"The Secretary also has invitations from the Chicago Association of Commerce, The Columbus Conventions and Publicity Association, the Conventions Committee of the New Haven Chamber of Commerce, the Publicity and Conventions Bureau, Portland, Ore., Chamber of Commerce, the Toledo Convention and Tourist Bureau, and from Edward B. Temple, President of the Philadelphia Association of Members of the Society, enclosing letters from the Mayor and from the Philadelphia Chamber of Commerce, all inviting the Society to hold its next Annual Convention in their cities.

"Respectfully submitted,

"CHAS. WARREN HUNT,

"Secretary."

GEORGE F. SWAIN, PAST-PRESIDENT, AM. SOC. C. E.—I move that the time and place for holding the next Convention be referred to the Board of Direction with power.

(Motion seconded.)

THE SECRETARY.—Mr. President, before that motion is put, I think it might be well to inform the meeting that the Society is now divided into 13 districts, 12 of which are non-resident, and that a committee of the Board of Direction has been appointed for the purpose of establishing a rotation between those districts, so that the Conventions of the Society will be held automatically, first in one and then in another section of the country; and the scheme is, that when that order is established, the members residing in that particular district shall simply be asked where in that district they want the Convention held.

THE PRESIDENT.—You have heard the motion. Are you ready for the question? All in favor of the motion to refer this matter of the time and place of holding the Annual Convention to the Board of Direction, please say "aye"; contrary-minded, "no". It is a vote.  
(Motion carried.)

THE PRESIDENT.—The next business is Reports of Special Committees. Are there any Chairmen of Special Committees here who want to report?

THE SECRETARY.—Mr. President, the only report that was expected, so far as I know, was that of the Special Committee on Concrete and Reinforced Concrete. The instructions to that Committee were to present a final report on July 1st, 1916.

THE PRESIDENT.—Is there any one here from that Committee?

J. V. VIVOND DAVIES, M. AM. SOC. C. E.—I would like to move, Mr. President, the discharge of the Special Committee on Concrete and Reinforced Concrete.

In doing so, I wish to make an explanation to the membership.

Over a year ago, when I became a member of the Board of Direction, the Board was treated by some of the various Special Committees as though the Board of Direction did not exist.

The Board asked for the presentation of budgets by the various Special Committees, in order to obtain a knowledge of what was going to be spent and of what the duties and obligations of the Society might be in relation to these Special Committees.

The majority of these Special Committees are doing splendid work; however, at the end of the year it became obvious that, despite the efforts of the Board, these Committees were running on in their own way and manner. The Board, therefore, appointed a sub-committee of its own members, of which I was appointed Chairman with Mr. Lincoln Bush and Mr. Virgil G. Bogue, to study and consider the work of the various Special Committees. Thereupon, I communicated with



each Special Committee and requested information from each as to what work it intended to do, when it intended or contemplated completing its work, what budget appropriations should be made for its work, and, generally, what its plan of operations was to be.

In the early part of this year I received from the various Special Committees certain replies. The Special Committee on Concrete and Reinforced Concrete stated that it expected to make a final report by July 1st, that it had bills outstanding of more than \$3 000 unpaid, and that it required for the current year expenditures of \$675. I inquired of this particular Committee what was meant by this unpaid obligation and was told that it was the salary of its Secretary, a Member of this Society, and other disbursements that had never been authorized by the Board of Direction, and which the Board of Direction has since declined to recognize.

The Board appropriated \$675 for the work of this Committee for the current year, with the definite instructions, following the agreement of the Special Committee, that it would complete its work and report to this meeting of the Society, and by this meeting of the Society the work of that Committee would be terminated.

It was fully expected by the Board that the report of this Committee would be presented at this meeting and no such report is forthcoming. We have been recently criticized in the engineering press for the work of these committees, and are accused of allowing them to go to sleep. This Committee was organized in 1903, and has been existing for 13 years. Some 7 years ago—6 years after its original formation—it presented a report which was a divided report, the minority report being signed by four members of the ten who then formed the Committee. Since then, as far as I know, this Committee has not reported.

The cost to the Society for the various Special Committees has been growing by leaps and bounds, from \$316.93 in 1912 to \$10 188.24 in 1915, and the Society cannot afford to allow these expenditures to go on in this way.

At the beginning of the current year the Board of Direction, after careful consideration of the money available for the work of the Special Committees, appropriated an amount of \$5 000 for the aggregate work of the various Committees for the current year.

The Board recognizes that the work of these Special Committees is of vital importance to the best interests of the Society, but at the same time feels that it is necessary to make sure that the expenditure of the Society's money on these matters should be limited to some definite sum in each year, and that each Committee should present its report within a reasonable period after the date of its appointment.

This particular Special Committee was instructed that printing of



reports was to be done through the regular channels of the Society. Instead thereof, this Committee has proceeded individually and personally to order the printing of progress matter from the printers for a sum, which we are advised by the printers, as it has not come officially to us, of \$3 000, which the Board has not appropriated and which there is, apparently, no reason why it should appropriate; and, so far as we can ascertain, this printing is for a progress report for use of members of the Committee, but neither the Board, nor this meeting of the Society, has received advice as to the status of this report.

The work of this printing has been reduced by the printers, as a quotation to the Society, to the sum of \$1 500.

If any private corporation or private individuals carried on their business in this way, the services of these employees would soon be terminated. I, therefore, move, without any feeling in this matter, without any desire to prevent a proper discharge of the duties and work of this Committee, but in the interests of this Society, the discharge of this Committee at this time.

(Motion duly seconded.)

THE PRESIDENT.—You have heard the motion, which has been seconded. Are there any remarks?

MR. SWAIN.—Mr. President, since Mr. Davies spoke, and the motion was made, a good many members have come in, and I would like to ask, before the vote is taken, if any member of that Committee is present.

THE PRESIDENT.—Are there any members of the Special Committee on Concrete and Reinforced Concrete present?

ARTHUR N. TALBOT, M. AM. SOC. C. E.—I am sorry I did not get in early enough to hear more than the last words of the speaker. I am a member of that Committee. I have not known of any question of the conduct of the work of the Committee. I have been told that a letter has been sent to the Chairman of the Committee to the effect that the Board of Direction had requested the Committee to complete its work by July 1st.

The Committee has held six meetings since last October (twelve sessions), at which constructive work has been done, and there have been many meetings of sub-committees. The members of these sub-committees have given considerable time and also money for their expenses in doing work bearing on the final report of the Committee.

I do not know about the expenditures for printing. The printing which has been done, so far as I am aware, is the putting of the report in type in its preliminary form, so that the members might have it before them in clear form—a method which was quite necessary in a report of this character, which is not merely descriptive, but contains matter in which slight changes and differences in wording make a considerable difference in meaning.

This Committee has done a good deal of work throughout its life. It was organized in 1904. It has made two reports; and I think it is well established that the reports of this Committee have done a very great deal toward shaping the practice of reinforced concrete in this country, and have had a great influence, and are recognized as being works of value. I am very much astonished to hear that a motion should be made to have this Committee discharged. It seems to me that to pass this would be an injustice to the Committee, and that it would be done only without a knowledge of the circumstances connected with its work.

J. N. CHESTER, M. AM. Soc. C. E.—I heard only the last remarks of the former speaker. I am not familiar in any detail with the work that this Committee has been doing, nor do I know in any way what the product will be if the report is printed; but I believe that the personnel on that Committee assures us of something that is worth, not only the appropriation asked for, but our while to peruse and study when it comes into our hands.

There are few engineers who are not familiar with the extensive work done by Professor Talbot in the laboratories of the University of Illinois, and the value of its pamphlets and bulletins to the engineer; and for that reason let me implore that no such action as contemplated by Mr. Davies be taken. It is not only an insult to the Committee, but it is a disgrace to the Society to promulgate such a thing at a meeting like this.

MR. TALBOT.—May I say one word more that I intended to say when I was on my feet? A meeting of the Committee has been called at Atlantic City on Friday of this week, the 30th of June. It is expected that the work of the Committee is in such shape that it can be completed at that meeting. It has been the purpose of the Committee since last fall, to have its work completed by the summer.

It may be, of course, that some new discussion may arise that will not permit the work to be completed at that meeting, but it is expected that the report will be finally finished then.

JOHN A. FERGUSON, Assoc. M. AM. Soc. C. E.—Mr. President and fellow-members, what I have to say will be simple and brief. I wish to speak of the work of this Committee. It has been organized as the parent committee, associated with committees of other associations. These associated committees have not as yet presented their reports to their societies. I understand that they will do so in a very short time. The American Society for Testing Materials is to meet for this purpose on Friday of this week. It would appear that it is not logical for the parent committee to make its report until the sub-committees have made theirs to the Committee.

I think that to discharge this, the parent committee, before those affiliated with it have reported would be a breach of faith with them,

and it would put our own Society in the light of being unable to cope with its internal affairs. I don't know all about the working of the Board of Direction or of its authority over the committees, but it would appear to me that this Committee would be subject to the will of the Society. Should there have been any breach of the will of the Society or of the Board of Direction, I would think that it would be much wiser to deal directly with any person so offending, and leave the Committee and the members of the Committee who have not offended in their original standing with the parent Society and the other committees of the Joint Committee.

I know that this Committee has been working upon many things for which the engineering world has been waiting. I know that it has as members very good and eminent men well qualified to finish this work.

I am myself holding back the preparation of some ordinances of which this city is badly in need until I may know what is to be the finding of this Committee. My situation becomes more acute through every day's delay. As a Member of this Society, I am entitled to request that the stress that exists throughout the country in these matters be adjusted as quickly as possible, by a report of the Committee, and that the matter be not delayed by the discharge of the Committee.

Mr. Talbot, the only one of the Committee who is here, is, I know, strong, upright, and capable, and one of the best engineers of the country, and he will not delay this matter any more than it is necessary in order to get at the bottom of the matter. I would suggest that such action as is taken here support the work of the men of such caliber as his. And remember that every single day spells some advance in this art, and it is a very difficult matter to decide just what it is best to do in this whole problem. Thus it will be realized how hard it is to find a stopping place so as to make a report that will do what we want it to do.

THE PRESIDENT.—Any further remarks?

MR. DAVIES.—I would like to say one word that arises out of the last speaker's remarks. I, also, am a member of the American Society for Testing Materials. One of the troubles in the present situation appears to me to rest in, what I believe to be, the fact that the interests of the American Society of Civil Engineers are subordinate to other committees co-operating with it in this work.

If we cannot obtain a report from the Special Committee on Concrete and Reinforced Concrete now—13 years after the date of its appointment—the only way to defend the Board of Direction is to put the situation up to the membership, as I am doing now.

Personally, I do not care which way you vote in this matter, but I do want to put on you, the members of our Society, the onus of decid-

ing whether you wish this Committee to fulfill or ignore the obligations which it took upon itself 13 years ago, to finish its investigations and report to this Society.

MR. TALBOT.—I, also, am a member of the American Society for Testing Materials, a very excellent society, a society which is doing a strong work. In some respects, I wish the committee work of the American Society of Civil Engineers was as strong, active, and vigorous as the committee work of that society. The representatives of the American Society for Testing Materials on the Joint Committee on Concrete and Reinforced Concrete have not been unduly active; they are not more active than the membership from the American Society of Civil Engineers. As a matter of fact, it is the feeling of the officers of the American Society for Testing Materials that much of the work of this Committee is outside of the province of the American Society for Testing Materials, and though they have kept their connection with the work, it has been felt that the part in which that society was interested is connected with the materials, the concrete as concrete, and the materials which go to make up the concrete, rather than with features relating to building ordinances, the calculations of stresses, or the requirements of design.

MR. SWAIN.—I understand the situation is this. The Board of Direction has requested this Committee to submit its final report. Professor Talbot says it was requested to submit its final report by the end of the month.

MR. TALBOT.—So I am informed.

MR. SWAIN.—The Committee contemplates complying with the request, and expects to have its report completed and submitted by the end of this month, having its last meeting on the 30th. Under those circumstances it does not seem to me that it would be quite proper for this Society to discharge the Committee at this time; and it seems to me that the best form of the motion would be, that upon the receipt of the report of the Committee, which is expected within a few days, the Committee be discharged.

MR. DAVIES.—I accept that if Professor Swain will set some day as a date for the termination of that period.

MR. SWAIN.—I understand that the Committee has been asked by the Board to submit its final report by the end of this month, and it expects to submit it by the end of the month.

MR. DAVIES.—Then I am perfectly willing to accept the amendment.

THE PRESIDENT.—You have heard the motion as it is amended—

A. MARSTON, M. AM. SOC. C. E.—I think that we wish to uphold the authority of the Board of Direction, but that we do not wish to throw away the very excellent work which this Committee has been performing.

I am sorry to hear the criticism of the American Society for Testing Materials. That Society has had similar troubles in connection with the work of this same Committee; and the Board of Direction is not alone in experiencing difficulties of the kind described to-day. I think the difficulties are due, not to the membership of the Committee as a whole, but to certain members of the Committee. In spite of the difficulties mentioned, the report of the Committee should certainly be received, printed, and circulated widely.

MR. TALBOT.—If I may have another word, I submit that it is not fair to a Committee, which has given 12 years of time and which has done work through most of those 12 years, to discharge the Committee immediately upon the receipt of its report, without giving the Committee a chance to present it, without giving a chance to defend it, in case there is a minority report, as it seems quite possible there may be, from some member of the Joint Committee not a member of the Special Committee of the American Society of Civil Engineers.

If there is something connected with the financial management which is open to question (and I feel quite certain that the statements made here respecting the cost of printing the report are in error), then let the Board of Direction take that up, but do not bring it before the Society in Annual Convention, where there is little opportunity to know the status or to discuss the situation.

I feel that to pass such a motion as this would be, to use a common expression, a slam at the Committee and also at all Special Committees of the Society.

GARDNER S. WILLIAMS, M. AM. SOC. C. E.—It seems to me that we are confronted with an awkward and an unfortunate situation. This Committee was created before the present regulations of the Board regarding committees were promulgated. It was created by action of the Society, and is only a creature of the Board in so far as the Board has the general direction of the financial matters of the Society. If I remember the conditions under which it was created, it could only be dismissed by a meeting of the Society, either at this time or at the Annual Business Meeting. Am I not correct, Mr. Secretary?

THE SECRETARY.—I do not know. I believe that the original action was by the Society in Annual Meeting and that subsequently the Committee was appointed by the Board of Direction.

MR. WILLIAMS.—But pursuant to the act of the Society. Our Constitution is not altogether definite in these matters; but there is fairly good ground, at least, for the position that if that Committee is to be dismissed, it must be dismissed by the Society and not by the Board of Direction.

Now, we all know more or less of the personnel of that Committee. We know that it has upon it some of the most eminent men in the



Profession, in the particular branch involved, men against whom none of us could raise a finger. It is a fact, however, as I know from my own personal observation, that the Committee has not given to the Board of Direction the information which the Board was entitled to ask or entitled to receive. That cannot be denied by any member of the Committee who is conversant with the facts. The Board of Direction—I am not a member of it now, gentlemen—had no alternative but to come to you and to ask you to take this matter in hand. Now, the Committee says it is going to be good, and I hope it will be; I believe it will be; but I think that after this little airing of the situation it would be better if we were to substitute for the motions before the Society something to the effect that this Committee be given until the Annual Meeting in January to finish its report, and that at that time it be discharged.

I would offer that as a substitute for the motion that is now pending.

THE PRESIDENT.—Are there any further remarks?

G. G. UNDERHILL, Assoc. M. Am. Soc. C. E.—The situation before the Society is that it would like to get this report, and would like to have everything, the treatment of the Committee and the treatment of the Board, satisfactory; and I think that can be attained by a further amendment to the effect that unless the Committee presents its report by the next Annual Meeting that it be discharged. The effect of such action will be that if, at the next Annual Meeting, the report is presented, the Society will then be in a position to accept it, and give the proper thanks to the Committee for its work; but if the Committee during the next 6 months is still delinquent, it will be so in the face of the certain knowledge that at that time it will be discharged. I, accordingly, move to amend the amendment before the meeting to the effect that unless the Special Committee on Concrete and Reinforced Concrete presents its report at the next Annual Meeting, that it be discharged.

CHARLES F. LOWETH, M. Am. Soc. C. E.—I hope the last motion will not prevail. It seems to me that the Committee has had sufficient notice of the action that we take here. I am quite in accord with what Professor Underhill has said. I think that we should give the Committee until the next Annual Meeting to bring in its report, and that if further time is needed at that time, that the Committee can take it. I hope that that amendment will carry.

(Motion duly seconded.)

HENRY B. SEAMAN, M. Am. Soc. C. E.—I think that is the only course which the Society should take, after what has been said here to-day. It gives ample notice; it is not threatening; but it shows the tenor of opinion in the Society. We are impatient to get that valuable report, but we cannot get any report of value on 3 or 4 days' notice.



However, I think 6 months' notice should be sufficient, as I understand that the report is about completed. We can then take whatever action is advisable. I second Mr. Williams' motion.

MR. TALBOT.—As there seems to be no one else here who knows about the work of the Committee, I hope that I may be permitted to say one more word concerning the work of the last two years.

At the meeting of the Committee held in Baltimore, at the Annual Convention two years ago, the Committee decided to make another report, with the expectation that it would be the final report. Considerable matter was formulated before the time of the meeting, which was held in New York last October, and at that meeting it was definitely voted to make the report the final report and to ask the Society that the Committee be discharged.

There was some opposition to this action at the beginning, even from the officers of the American Society of Civil Engineers, because it was stated that with the difficulty in forming a Committee of this kind it would be much better to keep this Committee in existence, and, when a further consideration of the subject was needed, the work could be started again without difficulty, even with a changed personnel of the Committee.

The Committee, however, felt that it was wiser that this Committee should make its report and retire, and then when there is need for further report upon this subject and when further experience and data are available, a new committee may be appointed, with a new personnel, a new point of view, and the new committee would then take up the matter in an entirely new way.

It may be proper to say that, in the last 12 years, practice in reinforced concrete in this country has gone through a great growth and development. It was in a chaotic state in 1904, and the first report, made in 1909, helped to modify practice in design materially and to unify the practice of the country. The second report, made in 1912, was a revision and extension of the first.

The two reports went far toward standardizing methods of calculation, principles of design, limits of working stresses, and details of construction among engineers, building departments, and architects. Although not all the recommendations have been accepted in detail, the reports have had a strong influence on practice, and the principles of the reports have been quite generally accepted. It is hoped that the third report will go still further in giving the recommendations of the Committee on the principles of design for reinforced concrete structures.

A new subject being treated in the final report is the flat slab type of floor construction for heavy building work. To show something of the time required for formulating a report, a draft of a chapter, so-called, on flat slab construction was presented to the members of the

Committee before the October meeting. It was distributed to members of the Committee and to others who were engaged in reinforced concrete design and construction outside of the Committee, and another meeting was held in January, at which there was a wide divergence of opinion expressed as to whether the method and principles proposed were proper. I think you would all be surprised to know how divergent were the views held on the action of the flat slab structure and on the methods which should be followed in its design. An informal meeting of the Committee was held at Chicago in February, at which there were present representatives of several of the leading reinforced concrete construction interests, contractors, designers of so-called systems, and so forth; and they presented their views, offered their objections, and gave their opinions; they also presented data on building construction and tests that took time to be digested. The flat slab report was then modified by the sub-committee in May and discussed, and was presented, modified, and extended at a meeting held about a month ago; and that modified and extended report is one of the matters which will be considered at the meeting at the end of this week.

If a satisfactory formulation of the principles and methods of design for flat slab structures can be agreed to by this Committee, and then finally accepted in fair measure by the country, I think a great step in advance will have been made, and if necessary to accomplish this, a delay of a year, or even of two years, in the completion of the report would be compensated for.

I am not sure that the diversity of views held on some of these matters is appreciated, or the great differences among commercial and building interests which must properly be considered. I do not believe that you understand what differences in view there are, differences among designers as to how a structure acts, differences among various interests, all of which take time in obtaining agreement in action, or there would be no thought of passing a motion such as is proposed here to-day.

JOHN LUNDIE, M. AM. SOC. C. E.—Mr. President, I understand the present discussion is brought about because of the fact that this Committee is essentially a creature of a Convention or of the Members of the Society, and not appointed by the Board of Direction. Now, why would not this be the proper course: let the Convention turn back its powers of appointment to the Board of Direction. I, therefore, make a motion that this whole matter be turned over to the Board of Direction with power to act.

MR. SWAIN.—I would like to ask if Professor Talbot has any motion which he would like to suggest as covering the situation, which he thoroughly understands, as I think we all do, now.

MR. DAVIES.—I would like to state to Professor Talbot that if we had had furnished to us such information as he has given, as to the

work of the Committee and the difficulties of the Committee he represents, in arriving at its report, we would probably have felt differently. On February 10th last, I asked the Chairman of this Special Committee what was remaining to be done and how long it would take to complete the work of his Committee. There was at that time no intention or desire to hurry the Committee. The reply then was that it was the intention to issue, by July 1st of this year, a final report. This report has not yet made its appearance, and that is the reason why it has come up in the way it has.

MR. TALBOT.—Allow me to say that I have information from Mr. Worcester, the Chairman of the Committee, that he received from the Chairman of the Committee on Special Committees of the Board of Direction, word to the effect that the report received from the Chairman of the Committee on Concrete and Reinforced Concrete concerning its work was the only one received from any committee of the American Society of Civil Engineers.

MR. DAVIES.—That was the budget asking for the appropriation of \$675 plus \$3 000, which this Committee has expended in the past 3 years and for which the Board had never made appropriation. The expenditure included \$2 000 for the Secretary's salary and other expenses.

MR. TALBOT.—I do not anticipate trouble about the budget. The financial statements have been sent out by the Committee to its members.

I wish to say also that the Progress Report of this Committee, made at the Annual Meeting in New York last January, stated that the Committee expected to present its final report this year.

HENRY H. QUIMBY, M. AM. SOC. C. E.—I hope that neither the original motion nor any of the amendments to it will prevail. I think that the subject has been sufficiently aired, and that the most graceful thing will be to take no action upon it here. I think Dr. Talbot's statement ought to be a sufficient explanation of everything that has been done or not done, with the possible exception of the financial matter that Mr. Davies has complained of; and it does seem to me from what I know of the Joint Committee work, although I have nothing to do with the financial part of it, which is being handled by a Sub-committee on Ways and Means, that there must be some misunderstanding. I think we did not ask the American Society of Civil Engineers for \$3 675. That amount, in my mind, is about the total that we wanted from all the contributing societies together.

I am one of the representatives of the Testing Materials Society on the Joint Committee. It ought to be well understood here that the Special Committee of this Society is acting with representatives or corresponding committees of four other societies; and I think that the Special Committee of this Society was given express instruction

or authority so to act, whether it was by the Board of Direction or by a Business Meeting of the Society I do not remember. At any rate, their work must necessarily be done together, and it seems to me that it cannot be expected that any unit Committee can reasonably be required under a threat of dismissal to complete its work within a limited time.

Since no other member of the Joint Committee than Dr. Talbot has spoken, I feel as though I ought to say that what he has told of the work of the Joint Committee is a very moderate statement of it, and especially of the work of such of the members of that Committee as represent this Society.

I think that more of the work of the Joint Committee has been done by Dr. Talbot and his associates representing this Society than by the representatives of any other single society on the Joint Committee, and Mr. Davies' charge that this Society is being subordinated to other societies is unwarranted. Also, nearly all the members of the Joint Committee are members of this Society. What Mr. Davies said seems to me a very scant recognition of the work of this Committee. There has been a lot of work done and a lot of expense paid by the members of the Committee, during the 12 years of its existence. Not a year has passed without several meetings, and this year meetings are being held monthly.

The members of the Committee have paid their own railroad fares and hotel bills, and we should not be expected to pay also for typewriting and printing and postage.

I think the least this Convention can do is to accept Professor Talbot's information regarding the work done and to be done as constituting a satisfactory progress report. As he has said, we are programmed to meet at Atlantic City next Friday, 30th inst., and to continue in session until the substance of our final report is definitely determined. This is work that cannot be done in a day. It takes thought and time, because the subject is a large one.

I move, Mr. President, that the matter be laid on the table.

(Motion duly seconded.)

THE PRESIDENT.—There have been a great many motions made; some seconded and some not seconded. I shall put the motion that was last made and seconded, that the subject be laid on the table, unless anybody wishes to make further remarks on that subject.

JOHN C. TRAUTWINE, JR., ASSOC. AM. SOC. C. E.—Mr. President, may an Associate speak on this question?

MR. WILLIAMS.—A motion to lay on the table is not debatable. If we want to talk more let us seek another opportunity.

THE PRESIDENT.—I put the motion to lay on the table. All in favor say "aye"; contrary-minded, "no".



The Chair has no doubt. Unless objection is made the Chair declares the motion carried. It is carried.

Is there a report from any other Special Committee?

Is there any new business to bring before this meeting?

JOHN A. OCKERSON, PAST-PRESIDENT, AM. SOC. C. E.—In response to the welcome given us this morning, I offer the following:

"We greatly appreciate the cordial welcome extended to us by the City of Pittsburgh through its official representatives; and while the interval between our visits has been a long one, we have watched with interest and pride the rapid development of one of the great industrial centers of the world.

"We congratulate the city particularly on its galaxy of great captains of industry, who have contributed so much to the development and progress of our whole country, and we look for even greater achievements in the future.

"To the local members of our Society, and their associates, one and all, we extend our hearty thanks for the generous provisions made for our entertainment and instruction during the Forty-eighth Annual Convention.

"We trust that we may again have the privilege and pleasure of enjoying the hospitality of this progressive city."

MR. WILLIAMS.—I second that motion.

THE PRESIDENT.—You have heard the motion, which is seconded. Are there any remarks? If there are no remarks, I will put the motion. All in favor please say "aye"; contrary-minded, "no". It is a vote.

Is there any further new business to come before this meeting?

MR. SWAIN.—On behalf of a Committee of the Board of Direction, composed of Past-President Ockerson, Past-President McDonald, and myself, I beg leave to submit the following resolution with reference to our lamented deceased President:

"Whereas: It has pleased the Almighty, in His Infinite Wisdom, to remove from the scene of his earthly labors, Elmer Lawrence Corthell, President of the American Society of Civil Engineers; be it

"Resolved: That the members of the Society, in Annual Convention assembled, express their grief at the loss of so distinguished an Engineer and so lovable a Man, and their admiration for his many noble qualities of heart and mind. They are thankful that he was granted a life so long, so fruitful for the Profession and for Mankind; with pride and pleasant memories they testify to his eminence as an engineer, his enthusiasm for the best interests of the Profession, his sterling character as a man, his unswerving loyalty as a friend. With saddened hearts they deplore his loss, and extend their deepest sympathy to the family so heavily bereaved; with trust and faith they resign themselves to the will of Him who doeth all things for the best.

"Resolved: That these resolutions be transmitted to his family, and that a copy thereof be spread upon the records of the Society."

I move the adoption of these resolutions.

(Motion duly seconded.)

THE PRESIDENT.—Gentlemen, I suggest that we vote on this by a rising vote. All in favor please rise.

(Motion carried.)

Is there any new business to come before the Society?

WILLIAM N. BROWN, M. AM. Soc. C. E.—Mr. President and Gentlemen of the Society, I want to bring to the attention of the Society a matter that I think of interest to engineers, that is, the matter of Government competition in engineering along certain lines, thus depriving engineers of employment.

I think the members of the Board, personally, have had the matter brought to their attention, and they are taking action. I do not want to say anything, or to ask for any action that would embarrass them, but I think that a discussion of the subject, and bringing it to the attention of the members, might do some good. Perhaps the Secretary could give us some information as to what they are doing.

THE SECRETARY.—The Secretary cannot give very much information. There was a letter received by the Society which complained of interference by at least one of the Government departments or bureaus with the work of the private engineer. That matter was referred to the President of the Society, who has taken it up with that bureau, at least, but nothing definite has been established as yet.

THE PRESIDENT.—Are there any further remarks on that subject? There is no motion before the house. If there is any further new business to come before the Society now is the time to present it.

THE SECRETARY.—I have one or two announcements to make. With regard to the ballots on the question of the proposed movement of the Society Headquarters from 57th Street to 39th Street, for the information of the Membership, and in order to spread it on the minutes of the meeting, I will read the report of the tellers, who canvassed that ballot, addressed to the Board of Direction.\*

Mr. President, I have a list of the persons elected by the Board of Direction at its meeting of June 23d and 24th, 1916. There were 10 Members, 29 Associate Members, and 13 Juniors elected, and 18 Associate Members were transferred to the grade of Member and 9 Juniors to the grade of Associate Member. It would be a great pleasure to read those names, sir, if you would like to have it? Shall I read them, sir?

THE PRESIDENT.—If you think proper.

HUNTER McDONALD, PAST-PRESIDENT, AM. Soc. C. E.—I move that the reading be dispensed with.

(Motion duly seconded and carried.)

THE SECRETARY.—Mr. President, I have the following letter, which I have been asked to read to this meeting:

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\* See page 458.



"MAY 6, 1916.

"AMERICAN SOCIETY OF CIVIL ENGINEERS,  
"220 West 57th Street,  
"New York, N. Y.

"DEAR SIR: In September of this year there will be held in Philadelphia a lecture course in illuminating engineering which is expected to be of great importance in promoting the lighting art as a whole, and illuminating engineering as a specialty. As this is a matter of far-reaching importance, I take the liberty of enclosing herewith a statement concerning the lecture course, with the request first, that you have an announcement made before the meeting of your Society which I believe will take place during June, and second, that you assist the project by giving some publicity to it in your Society publications.

"Trusting that we may be benefited by your kind co-operation, I am

"Yours very truly,

"PRESTON S. MILLAR,

"Chairman."

Anybody interested may secure from the Secretary a copy of the programme of the course of lectures.

I have, with regret, Mr. Chairman, to announce the death of Charles Hopkins Cartlidge, of Chicago, Ill., elected Member, May 4th, 1904; died June 14th, 1916.

I have no further announcements to make, sir.

THE PRESIDENT.—The Secretary has no further announcements to make, but the Chairman of the Local Committee desires to make an announcement as to the programme.

GEORGE S. DAVISON, M. Am. Soc. C. E.—On behalf of the various sub-committees having charge of the programme, I want to impress on you the importance of immediately signifying your preferences for the excursions of Thursday. At the rear of the hall, or near the door, you will find slips, upon which you may record your choice. This is important, so that the various committees may be able to make such arrangements as may be necessary.

I also want again to request those who want tickets for the excursion to-morrow and the dinner dance, to get them at once; also for the automobile trip on Friday, for which there will be no charge.

The committees in charge of these three events must order luncheon for the parties, and as it is desired to make ample provision, I hope you will assist these committees by attending to the matter at once.

On behalf of the Golf Committee I would say that they have posted a notice termed "Golf Information" in the Registration Room; but the Chairman desires me to speak of the schedules of trains that leave in the morning for the tournament. He suggests that you might break up into parties and not all land at the course at the same time.

He also wishes me to read this paragraph from the notice: "Each player wishing to enter this tournament should place in the hands of the Golf Committee his 18-hole handicap on his home course, also par for the course, and the length of the course."

Mr. Chester, in charge of the "57 varieties" excursion, asks me to say that he must give the Heinz people notice to-morrow morning by 9 o'clock as to how many will be on the trip to the Heinz plant on Thursday. I am mentioning this particularly so that you may communicate this information to the ladies.

THE PRESIDENT.—If there is no further business before the meeting, and no further announcements to make, a motion to adjourn is in order. Is there any further business?

THE SECRETARY.—I move that the Board of Direction be requested to frame suitable resolutions of thanks for the courtesies which we will receive, but for which we cannot extend thanks at the present moment.

C. H. KEEFER, M. AM. SOC. C. E.—I wish to say, as a Member of the Board of Direction, that I have much pleasure in seconding this resolution.

I am sure that we all feel very much indebted to the Local Committee and the Pittsburgh members generally, for the opportunities they are giving us in meeting here. There are, no doubt, many of our "Brother" engineers who, like myself, are seeing Pittsburgh for the first time. We, I am sure, realize that in many ways it is the "Mecca" where, as "Engineering Pilgrims", we have come to the place of all places that men of our profession want to see at some time or other. There is so much provided for our professional benefit and social entertainment by the Local Committee that I feel sure we will be more than satisfied with the choice of Pittsburgh as a Convention city.

THE PRESIDENT.—You have heard the motion. I will repeat it, in the language of the brokers, it is a resolution to return thanks if, when, and as rendered, when the courtesies are rendered. All in favor say "aye"; contrary-minded, "no". It is a vote.

THE PRESIDENT.—Mr. Cummings wishes to distribute certain circulars, and that is the reason that the motion to adjourn is held in abeyance.

ALLEN HAZEN, M. AM. SOC. C. E.—Mr. President, I would like to ask what action, if any, has been taken in regard to the Alfred Noble Memorial.

THE SECRETARY.—Mr. President, the Chairman of the Committee on the Alfred Noble Memorial is present, I think. Mr. Bates might say a few words.

ONWARD BATES, PAST-PRESIDENT, AM. SOC. C. E.—I am very glad that that question has been asked, because the Committee has found that work of this sort moves very slowly, and I would not have you think that the Committee is sleeping on it. I shall explain as well as I can the present status of our work, and will be glad to answer any questions about it.

In the first place, the Committee had before it the necessity of procuring a site for the Memorial. I believe I am right in saying that the resolution of the Board of Direction authorizing this Memorial requires that it shall be built in the City of Washington, and it was necessary for us to select a site and to obtain Congressional approval, which was granted some time during the past winter.

In the next place, we had to employ a sculptor. In October last we engaged Mr. Paul Bartlett to prepare preliminary designs for the Memorial. Mr. Bartlett has promised to attend a meeting of the Committee which will be held during this Convention, and will then submit plans and photographs of his models.

We cannot hurry work of this character, and I reckon it is just as well in this case, because the last two years has not been a good time in which to ask contributions from engineers, and we hope for improved conditions from now on. It will be in order, as soon as the Committee can adopt the design, to advise engineers, members of this Society, and others, all who honor the Profession and who loved Alfred Noble, of their privilege to contribute to this Memorial. We will at that time be able to furnish a description of the proposed Memorial and its surroundings, with illustrations showing its character, and will then be ready to receive the money to pay for it.

Now, gentlemen, this is a National Monument, and we do not expect that we shall have to ask for money for its completion. It will be a matter of pleasure and of professional pride for us to contribute to a National Engineering Monument which is dedicated to Alfred Noble, and I am sure that all the money needed will come without effort. We have evidence of this, for some, without waiting to be asked, have already offered handsome contributions. Speaking for myself, this is the Engineers' Monument, for all engineers, young and old, each of whom should have a direct personal share in it, and I feel the same interest in a small contribution from a young man just starting on small salary, as in a large gift from the old engineers who have been exceptionally fortunate in their practice.

I hope the Committee will soon be able to report further progress, and to accompany the report with the statement that the subscription list is open. Now, if there is anything I can add I shall be pleased to do it, or to answer any questions.

THE SECRETARY.—Mr. Bates, as Secretary of the Committee, I would ask you to say a word upon the site that has been selected and approved.

MR. BATES.—I do not know whether I can make it plain to you just where the site is. I do not remember the streets very well. Please correct me if I make a wrong statement. It is on New York Avenue opposite the new Interior Building, which is now under construction. It is in form of a rectangle. I think a good point about this site is that it will have to be graded, trees will have to be moved, and we will have this rectangle block with cross-walks and diagonal walks, with the Memorial in the center, and the shrubbery adjusted for artistic effect. The trees are old, and it is just as well for us to have new trees put in to suit the general arrangement.

The Committee has been fortunate in having as a member Col. Harts, who is Superintendent of Buildings and Grounds, and is also Secretary of the National Fine Arts Commission, to which our plans must be submitted for approval.

A MEMBER.—What form will this memorial take?

MR. BATES.—I am sorry I cannot tell you, because the sculptor has not kept us in touch with what he is doing. We will consider the question of form at the meeting of the Committee which is to be held during this Convention. I may say this, that the Committee is not at present committed to any form.

THE SECRETARY.—I think it might be well to say that the Committee has decided that it shall not be in the form of a statue.

MR. BATES.—I believe it is not to be a picture statue.

THE SECRETARY.—It will be symbolic in some way or other.

HENRY GOLDMARK, M. AM. SOC. C. E.—I think there is no doubt that there has been a great deal of sculpture erected, in both New York and Washington, that is not good, artistically. It would be very desirable, I think, that anything that is built to honor Mr. Noble should be the best of its kind; I, therefore, hope that every effort will be made to get a memorial that will be absolutely of a high order; that there shall be no mistakes made, as there have been with the best of intentions in the case of many monuments, even some quite recently built in our larger cities.

MR. BATES.—I can only say that the Committee is seeking the best professional advice it can get. The Chairman is not an artist himself, but he is accustomed to weighing evidence.

THE SECRETARY.—Mr. President, it is necessary when you put up a monument, not only to have a sculptor but an architect. I can say that the Committee has the advice of the very best talent in both of those lines, and that the slow progress of the Committee is not due

to the fact that it did not want to hurry this matter, but that it could not do it any faster.

The Committee hopes, in a very few months, to place a design before the Profession that will be accepted, and it does not doubt that it will be able to do so.

THE PRESIDENT.—As far as the Chairman is informed, the motion to adjourn is now in order.

MR. WILLIAMS.—I move we adjourn.

(Motion duly seconded.)

THE PRESIDENT.—It has been moved and seconded that we adjourn. All in favor say "aye"; contrary-minded, "no". It is a vote.

#### Ladies Excursion

Tuesday, June 20th.—The visiting ladies were the guests of the Ladies General Committee on a special trolley trip to the East End, and for a general view of the city. The trip was very enjoyable, and was attended by 87 ladies. During the trip the ladies were the guests of Mr. H. J. Heins at his East End residence, where they were afforded an opportunity to inspect his collection of curios.

#### Dinner Dance

Tuesday, June 20th.—P. M.—A Dinner Dance, attended by 202 Members and guests, was held in the ball room of the William Penn Hotel; dancing was informal.

#### River Excursion

Wednesday, June 21st.—The day was devoted to a River Excursion. The party left at 8 A. M. by special train from the Pennsylvania Station to Lock No. 1 on the Monongahela River, where it embarked on the Steamer "Sunshine". Luncheon was served on the steamer, and the trip was made down the river to Pittsburgh. While the steamer was at Lock No. 3, the Chattanooga Drum Weir was operated for the benefit of the party, through the courtesy of Col. F. R. Shunk, Corps of Engineers, U. S. A. There was informal dancing on the boat, and 324 persons attended.

#### Excursions to Industrial Plants

Thursday, June 22nd.—Twelve parties were made up to visit the following plants: Carnegie Steel Co., McKinnis-Mitchell Construction Co., Rankin Plant, Universal Portland Cement Company's plant at Universal National Tube Co., McKeesport Plant, Armstrong Cork Co., H. J. Heins Co., U. S. Bureau of Mines and Bureau of Standards, American Bridge Co., Ambler Plant, Baltimore and Ohio Improvement, 323 Street Elevation, Carnegie School of Technology, Mellon Institute of Industrial Research and Laboratories of the University of



## FORTY-EIGHTH ANNUAL CONVENTION

## EXCURSIONS AND ENTERTAINMENTS

The arrangements were in the hands of the following Local Committee:

GEORGE S. DAVISON, *Chairman*;

J. A. ATWOOD,

D. W. MCNAUGHER,

ROBT. A. CUMMINGS,

EMIL SWENSSON,

RICHARD KHUEN,

E. B. TAYLOR,

MORRIS KNOWLES,

WM. GLYDE WILKINS,

PAUL L. WOLFEL.

**Ladies Excursion**

*Tuesday, June 27th, 1916.—2 P. M.*—The visiting ladies were the guests of the Ladies General Committee on a special trolley trip to the East End, and for a general view of the city. The trip was very enjoyable, and was attended by 87 ladies. During the trip the ladies were the guests of Mr. H. J. Heinz at his East End residence, where they were afforded an opportunity to inspect his collection of curios.

**Dinner Dance**

*Tuesday, June 27th.—7 P. M.*—A Dinner Dance, attended by 262 Members and guests, was held in the ball room of the William Penn Hotel; dancing was informal.

**River Excursion**

*Wednesday, June 28th.*—The day was devoted to a River Excursion. The party left at 9 A. M. by special train from the Pennsylvania Station to Lock No. 4 on the Monongahela River, where it embarked on the Steamer *Sunshine*. Luncheon was served on the steamer, and the trip was made down the river to Pittsburgh. While the steamer was at Lock No. 3, the Chittenden Drum Weir was operated for the benefit of the party, through the courtesy of Col. F. R. Shunk, Corps of Engineers, U. S. A. There was informal dancing on the boat, and 324 persons attended.

**Excursions to Industrial Plants**

*Thursday, June 29th.*—Twelve parties were made up to visit the following plants: Carnegie Steel Co., McClintic-Marshall Construction Co., Rankin Plant, Universal Portland Cement Company's plant at Universal, National Tube Co., McKeesport Plant, Armstrong Cork Co., H. J. Heinz Co., U. S. Bureau of Mines and Bureau of Standards, American Bridge Co., Ambridge Plant, Baltimore and Ohio Improvements, 33d Street Elevation, Carnegie School of Technology, Mellon Institute of Industrial Research and Laboratories of the University of



Pittsburgh, and Filtration Plant of the Pittsburgh Water Department. The foregoing works were visited by parties varying in numbers from 9 to 65.

### President's Reception and Ball

*Thursday, June 29th.—8.30 P. M.*—Three hundred and fifty-five Members and guests attended this ball. They were received by President and Mrs. Herschel assisted by other officers of the Society and their wives. The evening was a most enjoyable one, and dancing was kept up until a late hour.

### Golf Tournament

*Friday, June 30th.*—The Golf Tournament was participated in by a number of Members and guests of the Society, and was held at the Oakmont Country Club, which had courteously placed its Course and Club House at the disposal of those in attendance at the Convention. The tournament was an all-day affair, 36 holes being played for four trophies presented by the Local Committee.

### Automobile Drive

*Friday, June 30th.—10 A. M.*—Members and guests not participating in the golf tournament left the William Penn Hotel in special automobiles for a 50-mile drive through the country. The party stopped for luncheon at the Oakmont Country Club, where the golf tournament was being held, and returned to the hotel about 5 p. m. This was a large party, consisting of 253 Members and guests.

### Smoker

*Friday, June 30th.—8 P. M.*—The Engineers' Society of Western Pennsylvania tendered a "Smoker" to the Members of the Society and their guests, in the ball room of the William Penn Hotel. An interesting and amusing entertainment of music and vaudeville was presented, and the evening was a great success. The attendance was 525.

### Attendance

The following 323 Members were in attendance. There were also present 191 ladies and others of the families of members.

Adams, W. H. ....	Detroit, Mich.	Atwood, J. A. ....	Pittsburgh, Pa.
Affelder, L. J. ....	Pittsburgh, Pa.		
Africa, J. M. ....	Huntingdon, Pa.	Babcock, W. S. ....	New York City
Allen, Kenneth. ....	New York City	Baker, I. O. ....	Urbana, Ill.
Alvord, J. W. ....	Chicago, Ill.	Baker, J. J. ....	Johnstown, Pa.
Ammann, O. H. ....	New York City	Baldwin, A. S. ....	Chicago, Ill.
Anderson, J. H. ....	Pittsburgh, Pa.	Ball, C. B. ....	Chicago, Ill.
Atkinson, Asher, ..		Banks, J. E. ....	Ambridge, Pa.
	New Brunswick, N. J.	Bates, Onward. ....	Chicago, Ill.

- Beach, L. H.... Cincinnati, Ohio  
 Beard, V. D.... Pittsburgh, Pa.  
 Beebe, J. C.... Dayton, Ohio  
 Begg, R. B. H.... Blacksburg, Va.  
 Beggs, G. E.... Princeton, N. J.  
 Benschel, J. A.... New York City  
 Bigelow, E. M.... Pittsburgh, Pa.  
 Blackford, F. W.... Columbus, Ohio  
 Blickle, H. R.... Pittsburgh, Pa.  
 Blum, L. P.... Pittsburgh, Pa.  
 Boardman, C. S.... Buffalo, N. Y.  
 Bontecou, Daniel,  
     Kansas City, Mo.  
 Booth, A. A.... Spokane, Wash.  
 Boyd, W. C.... Pittsburgh, Pa.  
 Brady, S. D.... Fairmont, W. Va.  
 Bringham, H. M.... Pittsburgh, Pa.  
 Brower, I. C.... Evanston, Ill.  
 Brown, N. F.... Pittsburgh, Pa.  
 Brown, W. N.... Washington, D. C.  
 Brown, W. P.... Cleveland, Ohio  
 Bryant, B. H.... New York City  
 Bryson, Andrew, New Castle, Del.  
 Buckwalter, H. D.,  
     Harrisburg, Pa.  
 Burden, Morton, Pittsburgh, Pa.  
 Burns, C. S.... Kansas City, Mo.  
 Bush, H. D.... Baltimore, Md.  
 Bush, Lincoln, New York City  
 Byers, B. B. F., Pittsburgh, Pa.  
 Campbell, C. C., Philadelphia, Pa.  
 Cappelen, F. W.,  
     Minneapolis, Minn.  
 Casani, A. A.... Pittsburgh, Pa.  
 Case, G. W.... Pittsburgh, Pa.  
 Chandler, E. F., University, N. Dak.  
 Chase, C. E.... Pittsburgh, Pa.  
 Chester, J. N.... Pittsburgh, Pa.  
 Christie, H. L.... Pittsburgh, Pa.  
 Christy, G. L.... Pittsburgh, Pa.  
 Churchill, C. S.... Roanoke, Va.  
 Claybaugh, H. W.... Franklin, Pa.  
 Coe, C. S.... St. Augustine, Fla.  
 Collier, B. C.... Allentown, Pa.  
 Collins, C. P.... Johnstown, Pa.  
 Connor, E. H., Leavenworth, Kans.  
 Constant, F. H.... Princeton, N. J.  
 Cooley, M. E.... Ann Arbor, Mich.  
 Covell, V. R.... Pittsburgh, Pa.  
 Crellin, E. W.... Pittsburgh, Pa.  
 Crocker, H. S.... Denver, Colo.  
 Cummings, R. A.... Pittsburgh, Pa.  
 Cushing, W. C.... Pittsburgh, Pa.  
 Da Lee, W. A.... Pittsburgh, Pa.  
 Dambach, W. N.... Pittsburgh, Pa.  
 Danzilli, A. M.... Pittsburgh, Pa.  
 Davies, J. V.... New York City  
 Davis, A. P.... Washington, D. C.  
 Davis, D. E.... Pittsburgh, Pa.  
 Davis, Meyer.... Pittsburgh, Pa.  
 Davison, A. S.... Pittsburgh, Pa.  
 Davison, G. S.... Pittsburgh, Pa.  
 de Mey, E. J. B.... Pittsburgh, Pa.  
 Demorest, G. M.... Pittsburgh, Pa.  
 Develin, R. G.... Philadelphia, Pa.  
 De Vou, J. L.... Pittsburgh, Pa.  
 Deyo, S. L. F.... New York City  
 Dibert, H. M.... Troy, N. Y.  
 Didier, Paul.... Pittsburgh, Pa.  
 Dilworth, E. C.... Pittsburgh, Pa.  
 Doane, W. A.... Meadville, Pa.  
 Donley, W. M.... Pittsburgh, Pa.  
 Duis, F. B.... Wheeling, W. Va.  
 Dunnells, C. G.... Pittsburgh, Pa.  
 Duryea, Edwin, Jr.,  
     San Francisco, Cal.  
 Earl, G. G.... New Orleans, La.  
 Emanuel, M. C.... Erie, Pa.  
 Emerson, C. A., Jr.,  
     Harrisburg, Pa.  
 Endicott, M. T.,  
     Washington, D. C.  
 Ericson, E. G.... Pittsburgh, Pa.  
 Farnham, Robert, H. O.  
     Philadelphia, Pa.  
 Farrington, H. P., New York City

- Farris, John.....Pittsburgh, Pa.  
 Ferguson, J. A....Pittsburgh, Pa.  
 Fickes, E. S.....Pittsburgh, Pa.  
 Fisher, E. A....Rochester, N. Y.  
 Fisher, S. B....Parsons, Kan.  
 FitzGerald, C. C..Havana, Cuba  
 Fleming, Thomas, Jr., ..Pittsburgh, Pa.  
 Fort, E. J.....Brooklyn, N. Y.  
 Foss, F. E.....New York City  
 Foster, E. H....New York City  
 Fox, C. L.....Wilkinsburg, Pa.  
 Freeman, J. R..Providence, R. I.  
 Frick, Walter....Lewisburg, Pa.  
 Fuller, G. W....New York City  
 Gaillard, S. G..Philadelphia, Pa.  
 Geddes, D. Y....Zanesville, Ohio  
 Gibbs, E. A.....Pittsburgh, Pa.  
 Gifford, G. E....New York City  
 Godfrey, Edward..Pittsburgh, Pa.  
 Godfrey, Hollis..Philadelphia, Pa.  
 Goldmark, Henry..New York City  
 Goodwin, I. D...Pittsburgh, Pa.  
 Grafton, C. E.,  
     New Cumberland, W. Va.  
 Gray, S. M....Providence, R. I.  
 Gregory, W. B..New Orleans, La.  
 Groat, B. F....Pittsburgh, Pa.  
 Gudmundsson, Gisli,  
     Pittsburgh, Pa.  
 Haggart, C. N...Pittsburgh, Pa.  
 Hall, W. M..Parkersburg, W. Va.  
 Hammatt, W. C.,  
     San Francisco, Cal.  
 Hammond, G. T..Brooklyn, N. Y.  
 Hansel, Charles..New York City  
 Haring, J. S....Crafton, Pa.  
 Harlan, C. H....Pittsburgh, Pa.  
 Harshbarger, E. D.Pittsburgh, Pa.  
 Harvey, C. K....Pittsburgh, Pa.  
 Haskell, E. E....Ithaca, N. Y.  
 Haslam, E. E....Greenville, Pa.  
 Hatt, W. K....La Fayette, Ind.  
 Hatton, T. C....Milwaukee, Wis.  
 Haupt, Edward....Chicago, Ill.  
 Hawley, J. B....Fort Worth, Tex.  
 Hawley, W. C..Wilkinsburg, Pa.  
 Haydock, Charles,  
     Philadelphia, Pa.  
 Hazen, Allen.....New York City  
 Heerlein, R. W...Pittsburgh, Pa.  
 Heinonen, H. J..Canonsburg, Pa.  
 Hench, N. M....Pittsburgh, Pa.  
 Henderson, A. A..Pittsburgh, Pa.  
 Herschel, Clemens,  
     New York City  
 Hess, E. W.....Clearfield, Pa.  
 Hiles, E. K.....Pittsburgh, Pa.  
 Hopkins, N. F...Pittsburgh, Pa.  
 Howes, B. A.....New York City  
 Hubbell, G. S....Pittsburgh, Pa.  
 Hudson, Leo.....Pittsburgh, Pa.  
 Hughes, J. W.....Erie, Pa.  
 Hulse, S. C.....Bedford, Pa.  
 Humphreys, D. C..Lexington, Va.  
 Hunt, Charles Warren,  
     New York City  
 Husband, C. M...Pittsburgh, Pa.  
 Irvin, Richard...Pittsburgh, Pa.  
 Jackson, S. W...Pittsburgh, Pa.  
 Jonah, F. G.....St. Louis, Mo.  
 Jones, Jonathan..Philadelphia, Pa.  
 Jordan, J. C....Pittsburgh, Pa.  
 Joyce, W. E.,  
     Montreal, Que., Canada  
 Judd, W. M....Pittsburgh, Pa.  
 Keefe, D. A.....Athens, Pa.  
 Keefer, C. H.,  
     Ottawa, Ont., Canada  
 Ketchum, M. S...Boulder, Colo.  
 Khuen, Richard..Pittsburgh, Pa.  
 Kinney, W. M....Chicago, Ill.  
 Knoch, J. J....Fayetteville, Ark.  
 Knowles, Morris..Pittsburgh, Pa.  
 Knox, S. B.....New York City  
 Knutson, G. H....Jackson, Mich.

- Landreth, O. H., Schenectady, N. Y.  
 Lantz, C. I. Morgantown, W. Va.  
 Lathrop, J. C. Columbus, Ohio  
 Laub, Hermann, Pittsburgh, Pa.  
 Layfield, E. N. Chicago, Ill.  
 Layton, H. F. Pittsburgh, Pa.  
 Lee, A. L. Ambridge, Pa.  
 Leeper, J. B. Pittsburgh, Pa.  
 Leisen, T. A. Detroit, Mich.  
 Lewis, H. M. Brooklyn, N. Y.  
 Lewis, N. P. New York City  
 Lex, W. I. Philadelphia, Pa.  
 Linton, Harvey, Altoona, Pa.  
 Lockwood, J. B. C. Portland, Ore.  
 Loewenstein, Jacob, New York City  
 Long, C. E. Pittsburgh, Pa.  
 Loomis, Horace, New York City  
 Low, Emile, Buffalo, N. Y.  
 Loweth, C. F. Chicago, Ill.  
 Lowinson, Oscar, New York City  
 Lucas, G. L. New York City  
 Lundie, John, New York City  
 Lyon, F. W. Pittsburgh, Pa.  
 Machen, H. B. New York City  
 MacMinn, Robert, Pittsburgh, Pa.  
 McDonald, Hunter, Nashville, Tenn.  
 McGee, R. K. Pittsburgh, Pa.  
 McGrew, A. B. Pittsburgh, Pa.  
 McHose, K. W. Wilkesburg, Pa.  
 McKibben, H. S. Warren, Ohio  
 McLain, L. R. St. Augustine, Fla.  
 McNary, J. V. Harrisburg, Pa.  
 McNaugher, D. W. Pittsburgh, Pa.  
 Maitland, Alex., Jr., Kansas City, Mo.  
 Mangold, J. F. Grinnell, Iowa  
 Manning, R. G. Ambridge, Pa.  
 Marston, Anson, Ames, Iowa  
 Martin, D. H., Port Robinson, Ont., Canada  
 Marx, C. D., Stanford University P. O., Cal.  
 Mehren, E. J. New York City  
 Merrill, F. S. Pittsburgh, Pa.  
 Metzger, F. L. Pittsburgh, Pa.  
 Miller, H. B. Pittsburgh, Pa.  
 Mitchell, S. P. Philadelphia, Pa.  
 Mogenssen, O. E. New York City  
 Morse, C. M. Buffalo, N. Y.  
 Morse, E. K. Pittsburgh, Pa.  
 Mott, W. E. Pittsburgh, Pa.  
 Munn, H. T. Pittsburgh, Pa.  
 Neeld, C. M. Pittsburgh, Pa.  
 Neff, F. H. Cleveland, Ohio  
 Neilson, G. H. Braeburn, Pa.  
 Norcross, P. H. Atlanta, Ga.  
 Ockerson, J. A. St. Louis, Mo.  
 O'Connor, J. A. Albany, N. Y.  
 Orr, D. K. Brownsville, Pa.  
 Osborn, K. H. Cleveland, Ohio  
 Parker, D. J. Pittsburgh, Pa.  
 Pegram, G. H. New York City  
 Pendergrass, R. A., Pittsburgh, Pa.  
 Perkins, W. W. C. Conneaut, Ohio  
 Phelps, E. B. Washington, D. C.  
 Porter, H. T. Greenville, Pa.  
 Potter, Alexander, New York City  
 Prichard, H. S. Pittsburgh, Pa.  
 Querbach, Earl, Ambridge, Pa.  
 Quick, R. S. Pittsburgh, Pa.  
 Quimby, H. H. Philadelphia, Pa.  
 Quincy, Edmund, New York City  
 Rankin, H. H. Pittsburgh, Pa.  
 Raymer, A. R. Pittsburgh, Pa.  
 Reppert, C. M. Pittsburgh, Pa.  
 Reynders, J. V. W. New York City  
 Rice, J. M. T. Pittsburgh, Pa.  
 Ridgway, Robert, New York City

Riegler, L. J. ....	Pittsburgh, Pa.	Tinker, G. H. ....	Cleveland, Ohio
Rights, L. D. ....	New York City	Tinkham, S. E. ....	Boston, Mass.
Rollins, J. W., Jr.	Boston, Mass.	Titsworth, R. B. .	Edgewood, Pa.
Royal, J. N. ....	Pittsburgh, Pa.	Todd, C. L. ....	Pittsburgh, Pa.
Rue, M. A. ....	New York City	Tolman, E. M.	Charleston, W. Va.
Rust, H. B. ....	Pittsburgh, Pa.	Townsend, C. McD.,	St. Louis, Mo.
Safford, H. R.,	Montreal, Que., Canada	Trautwine, J. C., Jr.,	Philadelphia, Pa.
Sax, P. M. ....	Philadelphia, Pa.	Triest, W. G. ....	New York City
Scaife, W. L. ....	Pittsburgh, Pa.	Tuttle, A. S. ....	New York City
Schade, C. G. ....	Pittsburgh, Pa.	Underhill, G. G. .	Albany, N. Y.
Scharff, M. R. .	Pittsburgh, Pa.	Van Ornum, J. L. .	St. Louis, Mo.
Schein, Nathan. .	Pittsburgh, Pa.	Waddell, J. A. L.	Kansas City, Mo.
Schlumpf, O. L. .	Sewickley, Pa.	Walker, J. W. .	Port Kennedy, Pa.
Scott, Guy. ....	Fort Wayne, Ind.	Watters, G. L.,	South Bethlehem, Pa.
Seaman, H. B. .	New York City	Weiss, H. O. ....	New York City
Shoemaker, L. H. .	Pittsburgh, Pa.	Weller, F. R. .	Washington, D. C.
Sickman, A. F. .	Holyoke, Mass.	White, T. S. .	Beaver Falls, Pa.
Simpson, G. H. .	Pittsburgh, Pa.	Whitney, J. T. .	Steubenville, Ohio
Skinner, J. F. .	Rochester, N. Y.	Wilcox, C. L. .	Pittsburgh, Pa.
Slater, W. A. ....	Urbana, Ill.	Wilcox, Frank. .	Pittsburgh, Pa.
Smith, J. R. ....	Braddock, Pa.	Wilkerson, T. J. .	Pittsburgh, Pa.
Smith, J. Waldo. .	New York City	Wilkins, W. G. .	Pittsburgh, Pa.
Snow, F. H. ....	Harrisburg, Pa.	Williams, G. S. .	Ann Arbor, Mich.
Sortore, A. E. .	Pittsburgh, Pa.	Williams, Marshall,	Pittsburgh, Pa.
Sprague, E. M. .	Cleveland, Ohio	Williams, S. D., Jr.,	St. Thomas, Ont., Canada
Sprague, N. S. .	Pittsburgh, Pa.	Williamson, C. S. .	Chicago, Ill.
Stevenson, J. D. .	Pittsburgh, Pa.	Willoughby, J. E.,	Wilmington, N. C.
Strachan, Joseph.	Brooklyn, N. Y.	Wilson, H. M. .	Pittsburgh, Pa.
Straub, T. A. .	Pittsburgh, Pa.	Wolfel, P. L. .	Pittsburgh, Pa.
Summers, R. E. J.,	Wilkinsburg, Pa.	Woodworth, R. B.	Pittsburgh, Pa.
Swain, G. F. ....	Boston, Mass.	Wooldridge, C. L.	Pittsburgh, Pa.
Swensson, Emil. .	Pittsburgh, Pa.	Wuest, Charles, Jr.,	Cincinnati, Ohio
Swensson, O. J. .	Troy, N. Y.	Yappen, Adolph. .	Chicago, Ill.
Talbot, A. N. ....	Urbana, Ill.	Zearley, E. L. .	Uniontown, Pa.
Talbot, K. H. .	Pittsburgh, Pa.		
Tarr, C. W. ....	Oakdale, Pa.		
Taylor, B. H. .	Pittsburgh, Pa.		
Taylor, E. B. .	Pittsburgh, Pa.		
Taylor, G. L. .	Pittsburgh, Pa.		
Taylor, S. A. .	Pittsburgh, Pa.		
Thayer, H. R. .	Pittsburgh, Pa.		
Thorley, I. O. .	Denver, Colo.		



## SOCIETY ITEMS OF INTEREST

## CHANGE OF SOCIETY HEADQUARTERS

## Canvass of Ballots on Movement of Society Headquarters

## Report of the Tellers

## BOARD OF DIRECTION

## AMERICAN SOCIETY OF CIVIL ENGINEERS:

The Tellers appointed to canvass the ballots on the Proposed Change of Society Headquarters report as follows:

Total number of ballots received.....	3 027
Ballots from members in arrears of dues.....	42
" without signatures .....	12
" stamped, not signed.....	10
Number of ballots not canvassed.....	64
Number of ballots canvassed.....	2 963

- (1) Shall the American Society of Civil Engineers accept one of the offers made in behalf of the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, through the United Engineering Society?
- |     |       |                 |
|-----|-------|-----------------|
| Yes | 2 500 | Majority        |
| No  | 390   | 2 110 In favor. |
- (2) If the result of this ballot is in the affirmative:
- (a) Do you favor Plan "A" as outlined?
- |     |               |
|-----|---------------|
| Yes | 1 096         |
| No  | 248           |
|     | 848 In favor. |
- (b) Do you favor Plan "B" as outlined?
- |     |              |
|-----|--------------|
| Yes | 194          |
| No  | 695          |
|     | 501 Against. |
- (c) Do you favor leaving the question of the plan to be accepted in the hands of the Board of Direction?
- |     |                 |
|-----|-----------------|
| Yes | 1 795           |
| No  | 524             |
|     | 1 271 In favor. |

ARTHUR S. TUTTLE,

LINCOLN BUSH,

J. V. DAVIES,

CLEMENS HERSCHEL,

CHAS. WARREN HUNT,

Tellers.

JUNE 15TH, 1916.



**Change of Society Headquarters (Continued).****Resolutions Adopted by the Board of Direction of the American Society of Civil Engineers, June 23d, 1916**

Whereas, the following resolution was passed by the Trustees of United Engineering Society on June 24th, 1915, to wit:

"Resolved, That out of its desire to welcome the American Society of Civil Engineers into the fraternity of the Founder Societies and with a sense of the increased dignity and usefulness to the engineering profession which this adherence of the American Society of Civil Engineers would contribute, the United Engineering Society hereby desires to express the sentiment in favor of coalition which has been growing, and to invite the American Society of Civil Engineers to consider entering the United Engineering Society as an additional Founder Society; and the President is authorized to appoint a Committee to confer with any corresponding Committee of the American Society of Civil Engineers in the formation of a tentative plan which if this invitation is accepted can be referred on the part of the United Engineering Society to the governing bodies of the Founder Societies for their action."

and

Whereas, such resolution has been approved by the governing bodies of the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, and was likewise considered and approved by the Board of Direction of this Society, and

Whereas, conferences have been held between a Committee representing the United Engineering Society, and a Committee representing this Society, and offers have been made in letters dated July 6th, 1915, August 23d, 1915, and October 28th, 1915, by the Committee of the United Engineering Society to the Committee representing this Society, and

Whereas, by special ballot, canvassed June 15th, 1916, 2 500 of the Corporate Members of this Society voted in favor of the acceptance of the invitation of the United Engineering Society, and only 390 Corporate Members voted against such acceptance, and

Whereas, on that ballot the sentiment of a majority of those voting on each of the plans submitted was expressed in favor of the plan which provides for the addition of three stories to the present building of the United Engineering Society, and against the plan which does not provide for such additional stories, be it

Resolved, That this Board, acting in behalf of the American Society of Civil Engineers, accepts the invitation of the United Engineering Society made, in behalf of the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, to become one of the Founder Societies, in accordance with the terms and conditions contained in the before mentioned letter, dated July 6th, 1915, as

**Change of Society Headquarters (Continued).**

modified by the before mentioned letter, dated August 28d, 1915, which provide for the construction of three additional stories to the present building of the United Engineering Society, at an estimated cost of \$225 000. It is understood, in accordance with the terms of said letters, that the cost to this Society in any event is not to exceed \$250 000.

*Resolved*, That Clemens Herschel, Chas. Warren Hunt, and J. V. Davies be and are hereby authorized for, and in behalf of, this Society, to execute any agreements or other instruments that may be appropriate for carrying into effect, in accordance with the above, the plan whereby this Society shall enter the United Engineering Society as an additional Founder Society, this Society assuming therein an obligation to defray the expenses of such building operations, at a cost not to exceed \$250 000.

*Resolved*, That the whole question of financing the movement of Headquarters of the Society be referred to the Finance Committee for report, this to include action to be taken with regard to the sale of the Fifty-seventh Street property.

Clemens Herschel, Chas. Warren Hunt, and J. V. Davies, were appointed to represent the Society as members of the United Engineering Society whenever the American Society of Civil Engineers becomes legally one of the Founder Societies.

**MEMORANDUM AGREEMENT****BETWEEN UNITED ENGINEERING SOCIETY****AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS****THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS****AMERICAN INSTITUTE OF MINING ENGINEERS****AND****THE AMERICAN SOCIETY OF CIVIL ENGINEERS**

Memorandum of Agreement entered into this twenty-fifth day of July, 1916, between UNITED ENGINEERING SOCIETY, party of the first part, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, party of the second part, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, party of the third part, AMERICAN INSTITUTE OF MINING ENGINEERS, party of the fourth part, and THE AMERICAN SOCIETY OF CIVIL ENGINEERS, party of the fifth part.

The party of the first part being incorporated by an Act of the Legislature of the State of New York which became a law May 11th, 1904, and being the owner of premises consisting of land and its Building erected thereon known as the Engineering Societies Build-

**Change of Society Headquarters (Continued).**

ing, and located on West 39th Street, in the Borough of Manhattan, in the City of New York, and the parties of the second, third, and fourth parts hereto, being Founder Societies of the party of the first part, and an invitation having been extended by the party of the first part to the party of the fifth part to enter into the Fraternity of said Founder Societies by becoming a Founder Society of the party of the first part, such invitation meeting with the hearty approval of the parties of the second, third and fourth parts hereto, and the same having been accepted by the party of the fifth part hereto.

*Now*, for the purpose of consummating the plan for the entry of the party of the fifth part as such Founder Society which has been agreed to between the parties hereto, this Agreement *Witnesseth*:

*First*: The parties hereto and each of them do hereby agree that the party of the fifth part shall become a Founder Society of the party of the first part with like rights and relations in and with the party of the first part and with each of the other parties hereto as those now possessed and existing by and between the parties of the first, second, third and fourth parts.

*Second*: To that end the parties of the second, third, fourth and fifth part hereto and each of them do hereby request the party of the first part to enlarge its building above mentioned by adding thereto three additional stories as provided for by plans heretofore filed in the Building Department by Henry G. Morse, Architect, with such modifications as may be requisite or appropriate to meet legal requirements or as may be approved of by the Architect and the building Committee of the party of the first part and the party of the first part agrees so to do. The cost of making such enlargement not exceeding, however, the sum of \$250,000 will be paid by the party of the fifth part as its contribution as a Founder Society, and in lieu of the contribution which said party of the fifth part would have made under the Founder's Agreement between the aforementioned Founder Societies and the party of the first part, if the party of the fifth part had been originally a Founder Society of the party of the first part. The amount so contributed by the party of the fifth part shall be paid and advanced under and upon the terms of Treasurer's receipts of the party of the first part which shall be issued to the party of the fifth part at par for the amounts so contributed or advanced from time to time in the same form as Treasurer's receipts provided for in said Founder's Agreement, and the rights of the party of the fifth part growing out of, or respecting such contribution shall be identical with the rights of the existing Founder Societies respectively growing out of the payments or contributions made by them evidenced by

**Change of Society Headquarters (Continued).**

Treasurer's receipts provided for in said Founder's Agreement. In arriving at cost of enlargement under this contract interest at the rate of four and one-half per cent. ( $4\frac{1}{2}\%$ ) on payments made prior to the completion of such enlargement shall be deemed to be part of such cost.

*Third:* The party of the first part agrees that any excess over the sum of \$250,000 in the cost of making the above mentioned enlargement to its building will be borne and paid by the party of the first part.

*Fourth:* Upon the party of the fifth part becoming a Founder Society its Library shall be added to the joint Library of the parties of the first, second, third and fourth parts to be controlled and administered as one joint Library by the Library Board of the United Engineering Society in accordance with the By-Laws of such Society, and each of the parties hereto agrees that upon the party of the fifth part becoming a Founder Society, it will enter into a Library Agreement with respect to such joint Library as increased by the Library of the party of the fifth part, which said agreement shall, with the omission of paragraphs "9th" and "10th" thereof, and the addition of the party of the fifth part as a party thereto, be in like form as the existing Library Agreement between the existing Founder Societies and the party of the first part.

*Fifth:* The parties hereto severally agree that upon the party of the fifth part becoming a Founder Society they will enter into a new Founder's Agreement which shall supplant and be a substitute for the existing Founder's Agreement, and which said new Agreement shall read as follows, to wit:

"MEMORANDUM OF FOUNDER'S AGREEMENT entered into this day of 191, between UNITED ENGINEERING SOCIETY, party of the first part, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, party of the second part, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, party of the third part, AMERICAN INSTITUTE OF MINING ENGINEERS, party of the fourth part, and THE AMERICAN SOCIETY OF CIVIL ENGINEERS, party of the fifth part.

"The party of the first part being incorporated by an Act of the Legislature of the State of New York which became a law May 11th, 1904, and being the owner of land and a building erected thereon known as the Engineering Societies Building, located on West 39th Street, in the Borough of Manhattan, in the City of New York, and the parties of the second, third and fourth parts having been heretofore Founder Societies of the party of the first part, and having together with said party of the first part on or about January 26th, 1905, executed an agreement known as the Founder's Agreement as provided for in the By-Laws of the party of the first part, and the

**Change of Society Headquarters. (Continued).**

"party of the fifth part having become an additional Founder Society of the party of the first part, with like rights and relations in and with the party of the first part, and with the parties of the second, third and fourth parts, as those heretofore possessed and existing by and between the parties of the first, second, third and fourth parts, and the parties of the second, third and fourth parts having heretofore each made certain payments or advances by way of contribution to the United Engineering Society under and upon the terms of Treasurer's receipts, provided for in said Founder's Agreement, and the party of the fifth part hereto having heretofore agreed, as its contribution to said United Engineering Society, and in lieu of the contribution which it would have made under said original Founder's Agreement if it had been originally a Founder Society, to pay the cost of the enlargement of the said building, not exceeding however, the sum of \$250,000 as is more fully provided for by agreement between the parties hereto dated the \_\_\_\_\_ day of \_\_\_\_\_ 191\_\_\_\_, such contribution by the party of the fifth part to be made under and upon the terms of the Treasurer's receipts of the party of the first part hereinafter set forth, and

"Whereas, for the aforementioned contributions heretofore made by each of the parties of the second, third and fourth parts, such Treasurer's receipts have been issued, and

"Whereas, the parties of the second, third, fourth, and fifth parts hereto are desirous of enjoying the privileges of Founder Societies of the said party of the first part as provided for in the By-Laws of the said United Engineering Society, now these presents Witnesseth:

"The parties of the second, third, fourth and fifth parts do severally, each for themselves and not for each other, promise and agree to and with each other and with the party of the first part, to permanently maintain their principal offices in the building of the party of the first part, subject to the provisions of the By-Laws of the United Engineering Society as they now exist or may hereafter be amended, such agreements of the parties of the second, third and fourth parts being effective now, and such agreement of the party of the fifth part to become effective from, and beginning with the time of the completion of the enlargement above mentioned. The amounts heretofore contributed to the party of the first part by the parties of the second, third and fourth parts having been paid and advanced under and upon the terms of Treasurer's receipts of the party of the first part issued at par for the amounts so paid or advanced from time to time in the following form, it is agreed that the contribution of the party of the fifth part for, or towards the cost of making the enlargement of the building hereinabove mentioned, not exceeding the sum of \$250,000, shall likewise be paid and advanced under and upon the terms of such Treasurer's receipts of the party of the first part, which shall be issued at par for the amounts so paid or advanced from time to time, such Treasurer's receipts to be in the following form, to wit:



**Change of Society Headquarters (Continued).****"TREASURER'S RECEIPTS."**

"This Certifies that United Engineering Society (herein called the payee) has received from American Engineers (herein called the payor) the sum of (\$ ) to be used and invested by the payee in carrying out its corporate purposes, said amount being so paid as part consideration for the admission of the payor as a Founder Society of the payee, under and subject to the by-laws of the payee.

"It is Agreed by the payor that interest on the amount of this receipt is and will be deemed discharged by privileges accorded to the payor as a Founder Society as provided in the by-laws of the payee, and that no right to recover any of the principal of such amount or interest thereon, shall exist so long as the payee shall be in existence and perform its corporate functions. Neither this receipt nor the claim for the amount evidenced thereby is transferable and any assignment or encumbrance of said receipt or claim, shall make the same void. Neither this receipt nor said claim shall be redeemable or payable excepting out of such portion of the reserve fund of the payee as may be appropriated therefor by a vote of the majority of the representatives of each of the Founder Societies on the Board of Trustees of the payee, as such Board shall then be constituted, it being understood that any such appropriation, if made, shall be applied pro rata upon such of the claims represented by treasurer's receipts issued to and then held by such of the Founder Societies as shall then be represented in the Board of Trustees of the payee.

"This receipt and the claim evidenced thereby, shall not be subject to any indebtedness of the payor to the payee and shall become void as an evidence of indebtedness or obligation to said payor in case said payor shall for any cause cease to have representation upon the Board of Trustees of the payee.

"UNITED ENGINEERING SOCIETY.

" . . . . . Treasurer.  
 " . . . . . President.

"Dated, New York . . . . . 19 . . . . ."

"And each of the Parties of the second, third, fourth and fifth parts hereto does further covenant and agree severally, and each only for itself, to and with each other, and to and with the party of the first part, that it will abide by and comply with the by-laws of the party of the first part and will pay when due all assessments levied against it, in accordance with the by-laws of the party of the first part. The party of the first part, in consideration of this agreement, has adopted its by-laws, and has admitted or will admit the parties of the second, third, fourth and fifth parts hereto, as Founder Societies, in accordance with the provisions thereof, and has acquired property and assumed obligations for the purpose, among other things, of enabling it to accord privileges in its building to the parties of the second, third and fourth and fifth parts, and this instrument is executed by the parties of the second, third, fourth and fifth parts



**Change of Society Headquarters (Continued).**

"hereto in consideration thereof, and to induce said party of the first part to take such action. And each of the several parties hereto has assumed the obligations herein contained in consideration of the agreements and obligations of each of the other parties hereto.

"This agreement is entered into in lieu of, and as a substitute for the Founder's Agreement heretofore entered into between the first four parties hereto, it being agreed however, that the Treasurer's receipts heretofore issued pursuant to the original Founder's Agreement shall remain operative and of the same order of validity and priority as Treasurer's receipts to be issued hereunder to the party of the fifth part,

"In Witness Whereof, the several parties hereto have caused these presents to be executed by their respective officers, and their corporate seals to be hereunto affixed."

*Sixth:* The parties hereto severally agree that they will, with all convenient speed, cause the By-Laws of the party of the first part to be amended in such respects as may be necessary to carry into effect the purposes of this Agreement, and that they will do and cause to be done, such acts and execute such instruments as may be necessary or reasonably appropriate to carry into effect such purposes.

*Seventh:* Pending the completion of the enlargement of said building and in anticipation of the formal execution of this instrument by the parties of the second, third and fourth parts hereto, the parties of the first and fifth parts may, upon the execution of this agreement by them, proceed with the aforementioned enlargement of said building and any sums paid or advanced in that behalf by the party of the fifth part shall be deemed to be paid and advanced towards such enlargement under and pursuant to the terms and provisions of this agreement. With respect to any payments required to be made from time to time for the cost of the above mentioned enlargement, the party of the fifth part shall have thirty days from notice to it by the Building Committee that such amount will be required, within which to pay the same.

*Eighth:* No assessment for space other than in connection with the Library shall be made against the party of the fifth part until the Building Committee shall certify that the above mentioned enlargement is ready for occupancy.

*Ninth:* Annexed hereto, marked "A" is a copy of the Charter and By-Laws of the party of the first part, and annexed hereto, marked "B" and "C" are copies of notices of proposed amendments to the By-Laws of the party of the first part, and annexed hereto, marked "D" is a copy of the Library Agreement hereinabove referred to, and the first four parties hereto agree that they will cause the adoption of said amendments and of each of them as soon as practicable.

*In Witness Whereof,* this Agreement has been executed by the representatives of the respective parties hereto thereunto duly author-

**Change of Society Headquarters (Continued).**

ized and the seals of the respective parties hereto have been hereunto duly affixed the day and year first above mentioned.

**UNITED ENGINEERING SOCIETY**

By Charles F. Rand, *President*,

Jos. Struthers, *Treasurer*.

**AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS**

By H. W. BUCK, *President*,

F. L. Hutchinson, *Secretary*.

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS**

By D. S. Jacobus, *President*,

Calvin W. Rice, *Secretary*.

**AMERICAN INSTITUTE OF MINING ENGINEERS**

By L. D. Ricketts, *President*,

Bradley Stoughton, *Secretary*.

**THE AMERICAN SOCIETY OF CIVIL ENGINEERS**

By Clemens Herschel, *President*,

Chas. Warren Hunt, *Secretary*,

J. Vipond Davies, *Director*.

**EXHIBIT A.**

Attached Separately in Bound Form.\*

**EXHIBIT B.****PROPOSED AMENDMENTS TO THE BY-LAWS OF THE UNITED ENGINEERING SOCIETY.**

- (1) Amend Section 6 by adding thereto the following:

"The entry of an additional Founder Society shall be evidenced by a similar certificate modified to conform to the facts, and executed by the Board of Trustees or a majority thereof," and striking out "as hereinafter provided."

- (2) Amend Section 7 by substituting a comma for the period at the end thereof, and adding "Civil" in quotations and then a period.

- (3) Amend Section 13 by making it read as follows:

"The Board of Trustees shall consist of twelve members, three of them representing the American Institute of Electrical Engineers, three of them representing the American Society of Mechanical Engineers, three of them representing the American Institute of Mining Engineers, and three of them representing the American Society of Civil Engineers."

- (4) Amend Section 14 by inserting at the beginning thereof the following:

"Each of the Founder Societies shall, at the outset, elect, appoint or designate its representatives upon the Board of Trustees

\* Charter and By-Laws of the United Engineering Society.

**Change of Society Headquarters (Continued).**

"by making provision for the expiration of the terms of office of said representatives so that the term of one shall expire on the adjournment of the next ensuing annual meeting; that of another one (1) year thereafter, and that of another two (2) years thereafter,"

and by adding after the words "the American Institute of Mining Engineers," the words "and the American Society of Civil Engineers," and striking out the word "and" before the words "the American Institute of Mining of Engineers."

(5) Amend Section 22 by substituting "twelve" for "nine," and "nine" for "seven."

(6) Amend Section 40 by substituting "seven" for "five."

(7) Amend Section 76 by substituting "nine" for "seven".

(8) Amend Section 77 by substituting "nine" for "seven."

(9) Amend Section 81 by substituting "nine" for "seven."

(10) Amend Section 107 by striking out the words "three" in two places where they occur.

(11) Amend Section 108 by substituting "nine members" for "seven members."

(12) Amend Section 124 by making it read as follows:

"The Engineering Foundation Board shall be constituted as follows:

"From United Engineering Society while remaining members of its Board of Trustees or until their successors are elected, four members, consisting of one representative of each Founder Society.

"From each Founder Society, upon the nomination of its governing body, one member not a member of the Board of Trustees of United Engineering Society.

"Two members at large.

"The President of United Engineering Society ex-officio."

(13) Amend Section 135 by adding after the words "Mining Engineers," the words "and The American Society of Civil Engineers."

(14) Amend Section 142 by substituting "nine" for "seven."

**EXHIBIT C.****PROPOSED AMENDMENT TO THE BY-LAWS OF THE UNITED ENGINEERING SOCIETY**

Amend Section 74 by striking out the following, viz.:

"In making such assessment the Board shall be under no obligation to apportion the amount of the Budget equally between the societies, or equally between any two or more of them, but the Board shall, in making such assessment, take into consideration the expenses of the society through the occupation by the various Founder and Associate Societies of the respective portions of the building occupied by each, and the facilities afforded to the respective Founder and Associate Societies"

**Change of Society Headquarters (Continued).**

and inserting in lieu thereof, the following:

"That portion of the budget in each year to be assessed against the Founder Societies other than the amount which they may be assessed for for allotment of space occupied by them shall be assessed against them in equal amounts."

**EXHIBIT D—LIBRARY AGREEMENT**

EXECUTED BY UNITED ENGINEERING SOCIETY AND THE FOUNDER SOCIETIES  
IN FEBRUARY, 1915

**AGREEMENT**

THE AMERICAN INSTITUTE OF MINING ENGINEERS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

(known as the "Founder Societies")

and the

UNITED ENGINEERING SOCIETY

in consideration of one dollar by each to the other in hand paid, the receipt whereof is hereby acknowledged, and of the mutual agreements herein contained, hereby agree, each with the other, that—

1st. The present Library of each of the said societies shall remain the property of that Society, each book or other article of each Library shall bear the bookplate of its owner.

2d. The four libraries of the said societies shall be controlled and administered as one Joint Library by the Library Board of the United Engineering Society, in accordance with the By-Laws of that Society.

3d. The future current purchase of books, periodicals and other literature for addition to the Joint Library, shall, under the direction of and with the approval of the Library Board, be made and paid for by the United Engineering Society; and each such purchase shall be the property of and bear the bookplate of the United Engineering Society; except that future purchases by the United Engineering Society of additional numbers to any serial publication now in the Library, shall carry the same bookplate as the earlier numbers and the entire publication shall continue to be the property of the Society represented by the bookplate.

4th. The cost of binding, the salaries of the Librarian and of all assistants, all supplies and other current expenses for the Library, shall, when approved by the Library Board, be paid by the United Engineering Society.

5th. The United Engineering Society, shall, as far as in its judgment its financial condition will permit, pay in each year the current expenses for books and all other costs of the administration of the Joint Library for the same year; and it shall have authority, now conferred by this agreement, to make equal assessments on each of the Founder Societies, to provide such additional funds as may be required, for the payment of said current expenses of the Library.

**Change of Society Headquarters (Continued).**

6th. The Library Board shall not incur or authorize bills of expense for books, or for the administration of the Library or for any other purpose in excess of the allowance for the Library in the budget of the United Engineering Society for the current year.

7th. The accounts of all income and expenditure for the Library shall be kept in the books of the United Engineering Society and such accounts shall be open to the inspection of any officer of any Founder Society.

8th. This agreement shall not in any way preclude any Founder Society from acquiring by purchase from its own funds, or by gift or exchange, any books, periodicals or other articles for its own library, and placing them in the Joint Library as its own property under its own bookplate.

The care and binding of such books, periodicals or other articles so acquired and placed, shall be at the expense of the United Engineering Society so long as they remain in the Joint Library.

9th. The agreement shall not become binding until it has been approved by resolution of the governing body of each of the four societies, parties hereto, and attested by the signatures of the President and Secretary of each.

10th. The agreement when formally approved and signed shall take effect as of January 1, 1915.

**Agreement Carried Out**

At its meeting of August 10th, 1916, the United Engineering Society carried out the above agreement by making the necessary changes in its By-laws, and the American Society of Civil Engineers thus became one of the four Founder Societies, the representatives of the Society in the United Engineering Society being Clemens Herschel, Chas. Warren Hunt, and J. Vipond Davies.

**Building Committee**

On July 6th, 1916, the President of the United Engineering Society appointed the following Building Committee, consisting of a representative of each of the four constituent Societies: H. H. Barnes, Jr., Chairman, H. G. Stott, Chas. Warren Hunt, and Charles F. Rand.

The Committee has held a number of meetings, and has awarded a contract for preliminary structural work, and the work was started by the Contractor, August 1st, 1916.



**Joint Conference Committee  
of the  
Four National Engineering Societies**

This Committee consists of three representatives from each of the following:

AMERICAN SOCIETY OF CIVIL ENGINEERS,  
AMERICAN INSTITUTE OF MINING ENGINEERS,  
AMERICAN SOCIETY OF MECHANICAL ENGINEERS,  
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

It has been acting under a Resolution adopted by each of the four Societies which gives

"to the Joint Conference Committee of Engineering Societies authority to take action on all general or public matters relating to the welfare of the Profession, and in connection with which joint action seems desirable; on the condition that the Joint Conference Committee records in its minutes any action taken and reports such action for approval at the next subsequent meeting of the governing bodies of each of the constituent societies."

At its meeting of June 16th, 1916, the following Resolution was adopted:

"The Joint Conference Committee of Engineering Societies believes that the development of the country's undeveloped water power will increase national prosperity; that private enterprise should be encouraged and stimulated to expedite such development; that unnecessary legal burdens should be removed and existing doubts as to the safety of investment eliminated. It commends to the support of engineers all efforts made to secure the fullest publicity as to the underlying facts regarding this subject."

Calvert Townley, Chairman, and Chas. Warren Hunt, Secretary of the Committee, were authorized to give this Resolution publicity. In a letter dated June 28th, 1916, the Secretary called the attention of the President of the United States to this action and to the fact that the Committee acts in behalf of about 30 000 Engineers.



**Arizona Meeting of the****American Institute of Mining Engineers**

In connection with the Arizona Meeting of the American Institute of Mining Engineers, September 18th to 25th, 1916, a Special Train Tour of the Arizona Mining Districts and the Grand Canyon has been arranged.

The special train will leave the Grand Central Terminal, New York, at 5.30 P. M., on Thursday, September 14th, 1916, and, going by way of Chicago, Kansas City, Topeka, El Paso, Santa Rita, Douglas, and Bisbee, will arrive at Globe, Ariz., at 9 A. M. on Thursday, September 21st. Mines, mills, and reduction works at Santa Rita, Hurley, Douglas, Bisbee, and Globe will be visited, and technical sessions will be held at several places *en route*. Two days will be spent at Globe, and visits will be made to the Roosevelt Dam, the Grand Canyon, the Cliff Dwellings, etc. Returning, the train will go by way of Phoenix, Albuquerque, La Junta, Kansas City, and Chicago, and will arrive in New York on Thursday, September 28th, at 9.40 A. M.

Members of the American Society of Civil Engineers will be welcomed on this trip, and may join the party at any point *en route*. Any member of this Society who is interested may obtain full particulars by addressing the Secretary of the Institute, Mr. Bradley Stoughton, 29 West 39th Street, New York City.

### ANNOUNCEMENTS

The House of the Society is open from 9 A. M. to 10 P. M., every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

### FUTURE MEETINGS

**September 6th, 1916.—8.30 P. M.**—A regular business meeting will be held, and a paper by J. C. Allison, Assoc. M. Am. Soc. C. E., entitled "Control of the Colorado River as Related to the Protection of Imperial Valley", will be presented for discussion.

This paper was printed in *Proceedings* for May, 1916.

**September 20th, 1916.—8.30 P. M.**—At this meeting, a paper by Israel V. Werbin, Assoc. M. Am. Soc. C. E., entitled "Tunnel Work on Sections 8, 9, 10, and 11, Broadway-Lexington Avenue Subway, New York City", will be presented for discussion.

This paper is printed in this number of *Proceedings*.

**October 4th, 1916.—8.30 P. M.**—This will be a regular business meeting. A paper by H. de B. Parsons, M. Am. Soc. C. E., entitled "Underpinning Trinity Vestry Building for Subway Construction", will be presented for discussion.

This paper is printed in this number of *Proceedings*.

### SEARCHES IN THE LIBRARY

In January, 1902, the Secretary was authorized to make searches in the Library, upon request, and to charge therefor the actual cost to the Society for the extra work required. Since that time many searches have been made, and bibliographies and other information on special subjects furnished.

The resulting satisfaction, to the members who have made use of the resources of the Society in this manner, has been expressed frequently, and leaves little doubt that if it were generally known to the membership that such work would be undertaken, many would avail themselves of it.

The cost is trifling compared with the value of the time of an engineer who looks up such matters himself, and the work can be performed quite as well, and much more quickly, by persons familiar with the Library.

In asking that such work be undertaken, members should specify clearly the subject to be covered, and whether references to general books only are desired, or whether a complete bibliography, involving search through periodical literature, is desired.

It sometimes happens that references are found which are not readily accessible to the person for whom the search is made. In that case the material may be reproduced by photography, and this

can be done for members at the cost of the work to the Society, which is small. This method is particularly useful when there are drawings or figures in the text, which would be very expensive to reproduce by hand.

### PAPERS AND DISCUSSIONS

Members and others who take part in the oral discussions of the papers presented are urged to revise their remarks promptly. Written communications from those who cannot attend the meetings should be sent in at the earliest possible date after the issue of a paper in *Proceedings*.

All papers accepted by the Publication Committee are classified by the Committee with respect to their availability for discussion at meetings.

Papers which, from their general nature, appear to be of a character suitable for oral discussion, will be published as heretofore in *Proceedings*, and set down for presentation to a future meeting of the Society, and on these, oral discussions, as well as written communications, will be solicited.

All papers which do not come under this heading, that is to say, those which, from their mathematical or technical nature, in the opinion of the Committee, are not adapted to oral discussion, will not be scheduled for presentation to any meeting. Such papers will be published in *Proceedings* in the same manner as those which are to be presented at meetings, but written discussions only will be requested for subsequent publication in *Proceedings* and with the paper in the volumes of *Transactions*.

The Board of Direction has adopted rules for the preparation and presentation of papers, which will be found on page 429 of the August, 1913, *Proceedings*.

### LOCAL ASSOCIATIONS OF MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

#### San Francisco Association, Organized 1905.

President, H. L. Haehl; Secretary, E. T. Thurston, 57 Post Street, San Francisco, Cal.

The San Francisco Association of Members of the American Society of Civil Engineers holds regular bi-monthly meetings, with banquet, and weekly informal luncheons. The former are held at 6 P. M., at the Palace Hotel, on the third Tuesday of February, April, June, August, and October, and the third Friday of December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 P. M., every Wednesday, and the place of meeting may be ascertained by communicating with the Secretary.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in San Francisco, and any such member will be gladly welcomed as a guest.

(Abstract of Minutes of Meetings)

**April 18th, 1916.**—The meeting was called to order at the Palace Hotel; President H. L. Haehl in the chair; E. T. Thurston, Secretary; and present, also, 78 members and guests.

The reports of the Committees appointed by the Entertainment Committee, namely, the Committee on Compensation of Engineers (H. C. Vensano), the Committee on General Conditions for Specifications (F. H. Tibbetts), and the Committee on Education of Engineers (M. H. Brinkley), were presented.

Messrs. F. H. Fowler, G. A. Elliott, and Thomas H. Means were appointed as the Entertainment Committee for the June meeting.

A communication from Treasurer P. E. Harroun was read relative to consolidating the offices of Secretary and Treasurer and suggesting that the three latest living Past-Presidents constitute the Board of Directors. After some discussion and amendment reducing the Board of Directors to five, Article IV, Sections 1 and 2, of the Constitution, was changed to read as follows, the change to take effect at the end of the current year:

"ARTICLE IV.

"OFFICERS

"SECTION 1. The officers of this Association shall be a president, two vice-presidents, and a secretary-treasurer, who, with the latest living past-president, shall constitute a board of directors in which the government of the Association shall be vested.

"SECTION 2. The terms of the office of the president of the Association shall be one year, of the vice-presidents and secretary-treasurer, two years. The term of each officer shall begin at the close of the annual meeting at which such officer is elected, and shall continue for the period above named, or until a successor is duly elected."

Relative to the question of the proposed merger of the Society with the United Engineering Society, the Secretary read communications on the subject from various sources. After considerable discussion, a motion that a vote be taken on "Proposition A" was laid on the table.

On motion, duly seconded, consideration of the suggestions for the extension of the influence and work of the Association, as embodied in the Inaugural Address of President Haehl, was laid over until the June meeting.

On motion, duly seconded, the President was instructed to appoint a committee of three to draw up and present to the proper authorities and publish in the newspapers, a resolution expressing the confidence of the members of the Association in Mr. L. H. Nishkian, who through political influence had been removed from his position as Engineer in the Department of Buildings of San Francisco. President Haehl subsequently appointed Messrs. H. J. Brunnier, J. D. Galloway, and M. C. Couchot as such Committee.

At the request of the Chairman, Mr. Galloway addressed the meeting briefly on preparedness from an engineer's standpoint, and sug-

gested the appointment of a committee to consider the question. On motion, duly seconded, the Chairman was instructed to appoint a committee of three to consider the subject, and Messrs. Galloway, Allan, and Rhodin were named.

A paper by Mr. M. M. O'Shaughnessy entitled "Some Observations, Professional and Otherwise, Made in Connection with a Recent Journey East", was presented by the author.

Adjourned.

**June 20th, 1916.**—The meeting was called to order at the Palace Hotel; President H. L. Haehl in the chair; E. T. Thurston, Secretary; and present, also, 40 members and guests.

The Entertainment Committee showed a series of moving pictures illustrating the laying of the submarine cables from Oakland to San Francisco for the Great Western Power Company and the Pacific Gas and Electric Company, respectively, and of the construction work on the hydraulic-fill dam at Calaveras Creek for the Spring Valley Water Company.

The Secretary read the report of the Preliminary Committee on Military Affairs, in which it was stated that a joint mass meeting of local members of the National Engineering Societies was held on May 2d, 1916, at which the attendance was about 300; papers were read by Capt. Parks, Corps of Engineers, U. S. A., Capt. Murphy, Coast Artillery, U. S. A., and by Mr. Allen Babcock, of the California Section of the Naval Consulting Board, and a resolution was adopted authorizing the appointment of a Permanent Joint Committee on Military Affairs consisting of three members from each of the Local Societies. President Haehl appointed Messrs. Galloway, Campbell, and Means to represent the Association on such Committee.

On motion, duly seconded, the original Committee was discharged with a vote of thanks.

A partial report of the Permanent Committee on Military Affairs was presented by the Secretary, announcing its organization, and that a circular describing its possible activities, etc., had been forwarded to Society members in California and Nevada. A resolution which accompanied this report, relative to the formation of a National Joint Committee on Military Affairs, was adopted unanimously by the Association.

The Secretary read letters from the Baltimore Association relative to its contribution to the State Board of Directors on Industrial Preparedness of Maryland, and from the Committee of Secretaries of the San Francisco Associations outlining a scheme of co-operation between the respective local societies in regard to meetings, etc.

A summary of the suggestions relative to extending the influence and work of the Association, as embodied in the Inaugural Address of President Haehl, was presented by the Secretary, and after discussion by Messrs. Snyder, Harroun, Dockweiler, and Griffin, the President was instructed to appoint a committee of three to consider the suggestions at the August meeting. The President subsequently appointed Messrs. Harroun, Huber, and Griffin as such Committee.



Mr. B. P. Legaré addressed the meeting relative to the Preparedness Parade to be held on July 22d, 1916, and the efforts being made to secure a proper representation of Engineers for that occasion. After some discussion, on motion, duly seconded, the official endorsement of the Association was given the parade, and the Board of Directors was authorized to co-operate in making up any deficit accruing in carrying out the project.

The President appointed Messrs. H. H. Hall, P. E. Brown, and E. L. Cope as the Entertainment Committee for the August meeting.

A paper by Mr. H. A. Whitney entitled "The Organization of Municipal Water Departments", was presented by the author, and discussed by Messrs. Schussler, Dockweiler, and others.

Adjourned.

#### **Colorado Association, Organized 1908.**

President, John E. Field; Secretary-Treasurer, L. R. Hinman, 1400 West Colfax Avenue, Denver, Colo.

The meetings of the Colorado Association of Members of the American Society of Civil Engineers (Denver, Colo.) are held on the second Saturday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary. The meetings are usually preceded by an informal dinner. Members of the American Society of Civil Engineers will be welcomed at these meetings.

Weekly luncheons are held on Wednesdays, at 12.30 p. m., at Clarke's Restaurant, 1632 Champa Street.

Visiting members are urged to attend the meetings and luncheons.

#### **Atlanta Association, Organized 1912.**

President, Paul H. Norcross; Secretary-Treasurer, Thomas P. Branch, Georgia School of Technology, Atlanta, Ga.

The Association holds its meetings at the University Club, Atlanta, Ga. Regular monthly luncheon meetings are held to which visiting members of the Society are always welcome.

#### **Baltimore Association, Organized 1914.**

President, H. D. Bush; Secretary-Treasurer, Charles J. Tilden, The Johns Hopkins University, Baltimore, Md.

(Abstract of Minutes of Meeting)

**May 3d, 1916.**—The Annual Meeting was called to order at 8.35 p. m., in the Donovan Room of The Johns Hopkins University; President Thomas D. Pitts in the chair; C. J. Tilden, Secretary; and present, also, 14 members and 1 guest.

The minutes of the meeting of May 5th, 1915, were read and approved.

Messrs. Janney, Mackall, Hartman, and Requardt were appointed a Nominating Committee to prepare a list of officers for the ensuing year.

The Secretary read various communications received by the Association relative to the proposed change of Society Headquarters. The subject was discussed, but no formal action was taken.

The reports of the Secretary-Treasurer for the year ending May 1st, 1916, were presented.

On motion, duly seconded, the President was instructed to appoint a committee to revise the Constitution of the Association, the proposed revision to be submitted at the next meeting.

On behalf of the Committee appointed to confer with the Engineers' Club in regard to combining on the questions of rooms, meetings, lectures, etc., consisting of Messrs. Pagon, Whitman, and Janney, Mr. Pagon reported that the subject had been considered, but that at present no action seemed to be possible, and requested that the Committee be discharged, which, on motion, duly seconded, was done.

Mr. H. D. Bush addressed the meeting on the work of the General Committee, appointed in connection with the Naval Advisory Board, to investigate the industrial resources of the country. Mr. Bush, who is Chairman of the Board of Directors of this Committee for the State of Maryland, presented the task which confronts the Maryland Board in this investigation. The subject was discussed by Messrs. Crosby, Pitts, Smith, Janney, and others, and the following resolution, introduced by Mr. Crosby, was adopted unanimously:

*"Whereas, a Board of Directors for the State of Maryland on Industrial Preparedness has been appointed by the Secretary of the Navy of the United States of America, and*

*"Whereas, said Board has been provided with no funds whatever for its necessary expenses, and*

*"Whereas, it seems to this Association proper that this Board should be relieved so far as possible from the financial burden of its work, which work further demands a considerable sacrifice of personal time and effort on the part of the individual members of the Board, therefore*

*"Be it Resolved, That in the interest of preparedness and with the desire to be of some aid to the members of the local Board in their patriotic work, the sum of fifty dollars (\$50.00) be, and hereby is, appropriated from the balance in the treasury of this Association for the use of the Local Board of Directors on Industrial Preparedness; and*

*"Be it Further Resolved, That the Treasurer be, and hereby is, authorized and directed to pay over this amount of fifty dollars (\$50.00) to the Treasurer, or other proper representative of said State Board of Directors on Preparedness."*

On motion, duly seconded, the Secretary was instructed to communicate this action to the Board of Direction of the Society and to the Secretaries of the Local Associations.

The report of the Nominating Committee was presented, and, on motion, duly seconded, the following officers were declared elected: President, H. D. Bush; Vice-Presidents, John Biddle and C. W. Hendrick; Directors, R. Lloyd Chamberlaine, R. Keith Compton, J. W. Craig, W. W. Crosby, H. A. Lane, Ezra B. Whitman, and Henry G. Shirley.

President Bush then took the chair, and appointed Messrs. Pagon, Pitts, and Tilden a Committee to revise the Constitution, to report at the next meeting of the Association.

Mr. D. B. Goodsell, of New York City, addressed the meeting relative to the recent formation of a battalion of more than 400 volunteer engineers in New York.

Adjourned.

**Cleveland Association, Organized 1914.**

President, Robert Hoffmann; Secretary-Treasurer, George H. Tinker, Hickox Building, Cleveland, Ohio.

**District of Columbia Association, Organized 1916.**

President, A. P. Davis; Secretary-Treasurer, John C. Hoyt, U. S. Geological Survey, Washington, D. C.

**Illinois Association, Organized 1916.**

President, Onward Bates; Secretary-Treasurer, E. N. Layfield, 4251 Vincennes Avenue, Chicago, Ill.

The regular meetings of the Association are held on the second Monday of March, June, September, and December, the last being the Annual Meeting. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary.

**Louisiana Association, Organized 1914.**

President, W. B. Gregory; Secretary, E. H. Coleman, 920 Hibernia Building, New Orleans, La.

**Northwestern Association, Organized 1914.**

President, W. L. Darling; Secretary, Ralph D. Thomas, Minneapolis, Minn.

**Philadelphia Association, Organized 1913.**

President, Edward B. Temple; Secretary, W. L. Stevenson, 412 City Hall, Philadelphia, Pa.

The regular meetings of the Association are held at the Engineers' Club of Philadelphia, 1317 Spruce Street, on the first Monday in January, April, and October, the last being the Annual Meeting.

**Portland, Ore., Association, Organized 1913.**

President, J. P. Newell; Secretary, J. A. Currey, 194 North 13th Street, Portland, Ore.

**St. Louis Association, Organized 1914.**

President, J. A. Ockerson; Secretary-Treasurer, Gurdon G. Black, 34 East Grand Avenue, St. Louis, Mo.

The meetings of the Association are held at the Engineers' Club Auditorium. The Annual Meeting is held on the fourth Monday in November. The time of other meetings is not fixed, but this information will be furnished on application to the Secretary.

**San Diego Association, Organized 1915.**

President, George Butler; Secretary-Treasurer, J. R. Comly, 4105 Falcon Street, San Diego, Cal.

**Seattle Association, Organized 1913.**

President, A. O. Powell; Secretary-Treasurer, Carl H. Reeves, 4722 Latona Avenue, Seattle, Wash.

The regular meetings of the Association are held at 12.15 p. m., on the last Monday of each month, at The Northold Inn, 212 University Street.

**(Abstract of Minutes of Meetings)**

**May 29th, 1916.**—The meeting was called to order at 12.15 p. m., at The Northold Inn; President A. O. Powell in the chair; Carl H. Reeves, Secretary; and present, also, 16 members and guests.

The minutes of the meeting of April 24th, 1916, were read and approved.

Letters from the President and Secretary of the Society relative to co-operation by the Association with the Committee on Industrial Preparedness of the Naval Consulting Board; from S. W. Stratton, Chairman of the Thermometer Committee of the American Association for the Advancement of Science; and from the Board of Direction of the Society to the Philadelphia Association *in re* the letters of J. A. Ockerson, Past-President, Am. Soc. C. E., relative to the removal of Society Headquarters, respectively, were read and ordered filed.

The death of Mr. F. W. D. Holbrook of the Association was referred to briefly by President Powell, and after special reference to the death of Elmer L. Corthell, President of the Society, Mr. Ernest B. Hussey addressed the meeting, giving a brief outline of the life and work of Mr. Corthell and closing with a tribute of appreciation of his labors in the field of engineering, business, and finance.

After discussion by Messrs. Horrocks, Reeves, Powell, Hussey, and Jackson in reference to participation by engineers in the Preparedness Parade to be held in Seattle on June 10th, 1916, it was moved, seconded, and carried that the Association request the Committee on Industrial Preparedness to arrange for an Engineering Section in the Preparedness Parade in order that all engineers who so desired, might be given an opportunity to march in such parade.

Mr. William D. Wrightson, a Sanitary Engineer in the United States Public Health Service, addressed the meeting briefly on his experience at Vera Cruz, Mexico, during the occupancy of that city by the United States troops under Gen. Funston.

Adjourned.

**June 26th, 1916.**—The meeting was called to order at 12.15 p. m., at The Northold Inn; President A. O. Powell in the chair; Carl H. Reeves, Secretary; and present, also, 13 members and guests.

The minutes of the meeting of May 29th, 1916, were read and approved.

The President announced that he had appointed Messrs. J. I. Horrocks, Chairman, J. E. Shoemaker, and M. O. Sylliaasen, a Committee to serve in connection with the Preparedness Parade which had been held on June 10th, 1916.

The attention of members of the Association who are handling the work of the Industrial Census for the Naval Consulting Board was

called, by the President, to the necessity for securing all such data at the earliest possible moment.

The President also called attention to pages 317, *et seq.*, of the May, 1916, *Proceedings* of the Society, in regard to the question of the relations between the National Engineering Societies and the Local Associations of their members, and announced that such relations would be the subject for special discussion at the July meeting.

A letter from the National Conference on City Planning inviting the Association to appoint delegates to its Convention in Cleveland, Ohio, on June 5th-7th, 1916, was read by the Secretary, who announced that the letter had been received too late to comply with the request.

A letter from Governor Lister was read asking the Association to appoint three delegates to a conference to be held in Tacoma, on July 11th-12th, 1916, to consider and formulate a Water Code for the State of Washington. On motion, duly seconded, the President was authorized to appoint three delegates to attend the Conference.

On motion, duly seconded, it was also decided that the delegates of the Association favor a uniform Water Code for the State.

The President announced that his appointees to the Water Code Conference would undoubtedly be members of the Legislative Committee.

Mr. E. S. Jackson, of Goodings, Idaho, addressed the meeting, briefly describing the general idea and workings of the Idaho Water Code.

Adjourned.

#### **Southern California Association, Organized 1914.**

President William Mulholland; Secretary, W. K. Barnard, 701 Central Building, Los Angeles, Cal.

The Southern California Association of Members of the American Society of Civil Engineers (Los Angeles, Cal.) holds regular bi-monthly meetings, with banquet, at Hotel Clark, on the second Wednesday of February, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 p. m. every Wednesday, and the place of meeting may be ascertained from the Secretary.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in Los Angeles, and any such member will be gladly welcomed as a guest at any of the meetings or luncheons.

#### **Spokane Association, Organized 1914.**

President, Ulysses B. Hough; Secretary, A. D. Butler, Spokane, Wash.

#### **Texas Association, Organized 1913.**

President, John B. Hawley; Secretary, J. F. Witt, Dallas, Tex.

#### **Utah Association, Organized 1916.**

President, E. C. La Rue; Secretary-Treasurer, H. S. Kleinschmidt, 306 Dooly Building, Salt Lake City, Utah.



MINUTES OF MEETINGS OF  
SPECIAL COMMITTEES  
TO REPORT UPON ENGINEERING SUBJECTS  
Special Committee on Concrete and Reinforced Concrete

**May 5th, 1916.**—The meeting was held at the House of the Society. Present, J. R. Worcester (Chairman), Robert W. Lesley, and Richard L. Humphrey (Secretary).

The Secretary presented a letter from the Secretary of the Society in reference to finances.

The Committee devoted the entire day to consideration of the preliminary draft of its final report.

The Committee agreed to hold its final meeting at the Hotel Traymore, Atlantic City, N. J., on Friday, June 30th, 1916, at 10.00 A. M., and to hold its next meeting at the House of the Society on June 6th, 1916.

**June 6th, 1916.**—The meeting was held at the House of the Society. President J. R. Worcester (Chairman), Olaf Hoff, Robert W. Lesley, Arthur N. Talbot, and Richard L. Humphrey (Secretary).

The Secretary presented a communication from the Secretary of the Society, calling the Committee's attention to the discussion, in the May, 1916, *Proceedings*, by Ernst F. Jonson, Assoc. M. Am. Soc. C. E., of the paper entitled "Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports", by A. C. Janni, M. Am. Soc. C. E., which was published in February, 1916, *Proceedings*.

The Committee devoted the entire day to the consideration of its final report, adjourning at 7.50 P. M., to meet on June 30th, 1916.

**June 30th and July 1st, 1916.**—The meetings were held at the Hotel Traymore, Atlantic City, N. J. Present, Joseph R. Worcester (Chairman), William K. Hatt, Robert W. Lesley, Arthur N. Talbot, and Richard L. Humphrey (Secretary).

The report of the Sub-Committee on Ways and Means was received, and on the request of the Chairman of the Sub-Committee, Messrs. Edward E. Hughes, of the American Society for Testing Materials, Olaf Hoff, and Robert W. Lesley, were appointed a committee to confer with the Society relative to finances.

The following motion was adopted:

"That a Committee on 'Editing', to consist of the Secretary and two other members of the Joint Committee, be appointed, which Committee shall be instructed to embody in the type now standing such changes as shall be adopted at this meeting of the Committee. This Committee shall be authorized to revise the table of contents, the running headings and cross references, and to correct typographical and grammatical mistakes and any inconsistencies, but not to change the meaning of any portion of the Report. After the type has been corrected, the Committee is to have duplicate proofs sent to each member of the Joint Committee, with the request that one copy be returned with any changes marked which may be discovered and with the member's written assent to the Report."

Messrs. Sanford E. Thompson and Henry H. Quimby were appointed as the two additional members of this Committee.

The Committee reconvened at 9.15 A. M. on July 1st, 1916, and spent the day and evening in completing the study of its final report, which, as amended, was adopted.

Verbal reports of the discussion of the work of the Committee at the Annual Convention of the Society at Pittsburgh, Pa., on June 27th, 1916, were considered, and the following resolution was adopted unanimously:

"Whereas, There has been brought to the attention of the Special Committee on Concrete and Reinforced Concrete the discussion of its work which took place at the Annual Convention of the American Society of Civil Engineers, in Pittsburgh, Pa., on June 27th, 1916, therefore,

"Be It Resolved, That the Secretary be instructed to request of the Board of Direction of the Society a copy of the stenographic report of this discussion."

#### **Special Committee on Stresses in Railroad Track.**

**May 10th and 11th, 1916.**—Three sessions were held at the University of Illinois, Urbana, Ill. Present, A. N. Talbot (Chairman), A. S. Baldwin, W. J. Burton, Charles S. Churchill, W. C. Cushing, Paul M. La Bach, C. G. E. Larsson, G. J. Ray, and F. E. Turneaure. There were also present, Messrs. Gennett and Morgan (representing Robert W. Hunt of the Committee), and F. F. Hanley (representing Earl Stimson of the American Railway Engineering Association).

The results of the experimental work carried out on the track of the Illinois Central Railroad, north of Champaign, Ill., during 1915, were discussed.

Tests on distribution of pressure through sand and broken stone ballast, made in the Laboratory of the University of Illinois, were presented and discussed.

Plans and methods for further tests were discussed at some length, and it was arranged to carry on additional tests on the Illinois Central Railroad to cover special points, and then to make the next tests on the Delaware, Lackawanna and Western Railroad.

The amount of funds necessary to complete the experimental work planned by the Committee was considered.

After the adjournment of the meeting, a number of the members observed an exhibition test on the track of the Illinois Central Railroad, north of Champaign, Ill., a Mikado locomotive being used.

#### **Special Committee on Materials for Road Construction**

**June 17th, 1916.**—The meeting was held at the House of the Society. Present, W. W. Crosby (Chairman), H. K. Bishop, A. W. Dean, Charles J. Tilden, George W. Tillson, and A. H. Blanchard (Secretary).

The minutes of the meeting of April 22d, 1916, were read and approved.

The outline and scope of the 1917 Report were discussed, and a section of the Report was adopted.

It was decided that the next meeting of the Committee should be held on June 26th, 1916.

**June 26th, 1916.**—The meeting was held at the Society House. Present, George W. Tillson (Chairman *pro tem.*), A. W. Dean, Nelson P. Lewis, Charles J. Tilden, and A. H. Blanchard (Secretary).

The minutes of the meeting of June 17th, 1916, were read and approved.

The sections of the 1917 Report relative to Stone Block and Wood Block Pavements were presented by Mr. Tillson, discussed, and tentatively adopted.

It was decided to hold the next meeting of the Committee on July 8th, 1916, at the House of the Society.

**July 8th, 1916.**—The meeting was held at the House of the Society. Present, George W. Tillson (Chairman *pro tem.*), Nelson P. Lewis, C. J. Tilden, and A. H. Blanchard (Secretary).

The minutes of the meeting of June 26th, 1916, were read and approved.

It was moved and carried that, in considering the different types of pavements, the Committee report only on pavements which have been in use for a sufficient length of time to demonstrate their economic value.

The sections of the 1917 Report relative to Brick and Slag Block Pavements, as presented by Mr. Lewis, and those pertaining to Bituminous Concrete Pavements, Types A, B, and C, Asphalt Block Pavements, and Sheet-Asphalt Pavements, as presented by Mr. Blanchard, were discussed and tentatively adopted.

On motion, the Committee adjourned to meet at the call of the Chairman about the middle of September, 1916.

#### **Special Committee on Valuation of Public Utilities**

**July 3d-7th, 1916.**—Thirteen sessions were held at the office of the Chairman in Boston, Mass. Present, F. P. Stearns (Chairman), C. S. Churchill, W. G. Raymond, H. E. Riggs, W. J. Wilgus, and J. P. Snow (Secretary *pro tem.*).

The part of the Report now in galley proof, covering the Glossary, Introduction, Fundamental Principles of Valuation, Property to be Included, Actual Cost, and Reproduction Cost, was thoroughly revised, and the remaining chapters on Reproduction of Land Holdings, Development Expense, Depreciation, and Intangible Values, were discussed, revised, and assigned to members to be put in shape for printing.

The meetings were adjourned on July 7th, 1916, to meet in September for further perfecting of the Report.

**PRIVILEGES OF ENGINEERING SOCIETIES  
EXTENDED TO MEMBERS OF THE  
AMERICAN SOCIETY OF CIVIL ENGINEERS**

Members of the American Society of Civil Engineers will be welcomed by the following Engineering Societies, both to the use of their Reading Rooms, and at all meetings:

**American Institute of Electrical Engineers**, 33 West Thirty-ninth Street, New York City.

**American Institute of Mining Engineers**, 29 West Thirty-ninth Street, New York City.

**American Society of Mechanical Engineers**, 29 West Thirty-ninth Street, New York City.

**Architekten-Verein zu Berlin**, Wilhelmstrasse 92, Berlin W. 66, Germany.

**Associação dos Engenheiros Civis Portuguezes**, Lisbon, Portugal.

**Australasian Institute of Mining Engineers**, Melbourne, Victoria, Australia.

**Boston Society of Civil Engineers**, 715 Tremont Temple, Boston, Mass.

**Brooklyn Engineers' Club**, 117 Remsen Street, Brooklyn, N. Y.

**Canadian Society of Civil Engineers**, 176 Mansfield Street, Montreal, Que., Canada.

**Civil Engineers' Society of St. Paul**, St. Paul, Minn.

**Cleveland Engineering Society**, Chamber of Commerce Building, Cleveland, Ohio.

**Cleveland Institute of Engineers**, Middlesbrough, England.

**Dansk Ingeniorforening**, Amaliegade 38, Copenhagen, Denmark.

**Detroit Engineering Society**, 46 Grand River Avenue, West, Detroit, Mich.

**Engineers and Architects Club of Louisville**, 1412 Starks Building, Louisville, Ky.

**Engineers' Club of Baltimore**, 6 West Eager Street, Baltimore, Md.

**Engineers' Club of Kansas City**, E. B. Murray, Secretary, 920 Walnut Street, Kansas City, Mo.

**Engineers' Club of Minneapolis**, 17 South Sixth Street, Minneapolis, Minn.

**Engineers' Club of Philadelphia**, 1317 Spruce Street, Philadelphia, Pa.

**Engineers' Club of St. Louis**, 3817 Olive Street, St. Louis, Mo.

**Engineers' Club of Toronto**, 96 King Street, West, Toronto, Ont., Canada.

**Engineers' Club of Trenton**, Trent Theatre Building, 12 North Warren Street, Trenton, N. J.

**Engineers' Society of Northeastern Pennsylvania**, 415 Washington Avenue, Scranton, Pa.

**Engineers' Society of Pennsylvania**, 31 South Front Street, Harrisburg, Pa.

**Engineers' Society of Western Pennsylvania**, 2511 Oliver Building, Pittsburgh, Pa.

**Institute of Marine Engineers**, The Minories, Tower Hill, London, E., England.

**Institution of Engineers of the River Plate**, Calle 25 de Mayo 195, Buenos Aires, Argentine Republic.

**Institution of Naval Architects**, 5 Adelphi Terrace, London, W. C., England.

**Junior Institution of Engineers**, 39 Victoria Street, Westminster, S. W., London, England.

**Koninklijk Instituut van Ingenieurs**, The Hague, The Netherlands.

**Louisiana Engineering Society**, State Museum Building, Chartres and St. Ann Streets, New Orleans, La.

**Memphis Engineers' Club**, Memphis, Tenn.

**Midland Institute of Mining, Civil and Mechanical Engineers**, Sheffield, England.

**Montana Society of Engineers**, Butte, Mont.

**North of England Institute of Mining and Mechanical Engineers**, Newcastle-upon-Tyne, England.

**Oesterreichischer Ingenieur- und Architekten-Verein**, Eschenbachgasse 9, Vienna, Austria.

**Oregon Society of Civil Engineers**, Portland, Ore.

**Pacific Northwest Society of Engineers**, 312 Central Building, Seattle, Wash.

**Rochester Engineering Society**, Rochester, N. Y.

**Sachsischer Ingenieur- und Architekten-Verein**, Dresden, Germany.

**Sociedad Colombiana de Ingenieros**, Bogota, Colombia.

**Sociedad de Ingenieros del Peru**, Lima, Peru.

**Societe des Ingenieurs Civils de France**, 19 rue Blanche, Paris, France.

**Society of Engineers**, 17 Victoria Street, Westminster, S. W., London, England.

**Svenska Teknologforeningen**, Brunkebergstorg 18, Stockholm, Sweden.

**Tekniske Forening**, Vestre Boulevard 18-1, Copenhagen, Denmark.

**Vermont Society of Engineers**, George A. Reed, Secretary, Montpelier, Vt.

**Western Society of Engineers**, 1737 Monadnock Block, Chicago, Ill.



## ACCESSIONS TO THE LIBRARY

(From May 2d to August 1st, 1916)

## DONATIONS\*

## LEVEL SECTION TRANSPARENT SCALES FOR PLATE "A" PROFILES

For Graduation, Arch Masonry, and Iron Culverts. By F. W. Steber. Morocco, 9 x 3 in., illus., unpagd. No place, The Author, 1915. \$2.50.

These scales have been made, it is stated, for estimating quantities from profiles made on Plate "A" profile paper. They are engraved on celluloid and bound in a form convenient for carrying in the pocket. For all ordinary excavation work and for transverse ground slopes up to 1 in 15, the scales, it is stated, are practically correct, and much steeper slopes can be safely estimated. For excavation and embankment there are three graduation tables with slopes of  $\frac{1}{2}$ :1, 1:1, and  $1\frac{1}{2}$ :1, as well as a table giving negative heights and quantities for various bases and slopes, with explanatory text. In the auxiliary tables the units are a prism of profile height with a base of 2 ft. and a triangle of profile height with a slope of  $\frac{1}{2}$  to 1. In the tables for arch culvert masonry the segmental arch is used, as suggested in Baker's "Masonry Construction". These tables are for arches of 6, 8, 10, 12, 14, and 16 ft., based on a 20-ft. base embankment with a slope of  $1\frac{1}{2}$  to 1. In these tables the scale of quantities is given in cubic yards and shows nothing below a 3-ft. cover over the crown of the arch. The tables for medium weight cast-iron culvert pipe include 24, 30, 36, 42, 48, 54, and 60-in. pipe, based on a 20-ft. base embankment with slopes of  $1\frac{1}{2}$  to 1. The scale of quantities for these pipes is in tons of 2000 lb. and shows nothing under a cover of 3 ft. over the top of the pipe.

## THE PORT OF BOSTON:

A Study and a Solution of the Traffic and Operating Problems of Boston, and Its Place in the Competition of the North Atlantic Seaports. By Edwin J. Clapp. Cloth, 9 x 6 in., illus., 12 + 402 pp. New Haven, Yale University Press, 1916. \$2.50.

The preface states that this book is the outgrowth of a private report, made to the Directors of the Port of Boston, on the traffic situation in Boston. The subject-matter, as stated in the secondary title, covers not only the traffic problems, but also those of operation, that is, the cost and facility of terminal operations on which depend the terminal service and charges. The author, it is said, has stated clearly the problems of the port and has indicated the main lines to be followed in their solution, and although the title reads "Port of Boston", the book, it is stated, has not been written for Boston alone, much attention having been given throughout the text to the theory of port charges and operations, and the practices of other Atlantic ports relative to belt lines, lighterage, elevator charges, and port industries, are also cited. The Contents are: Part I, Traffic: On the Meaning of Port Development; A, The Terminal Problem; B, Inland Rates; C, A Solution of the Traffic Problem; D, The Coastwise Traffic Situation. Part II, Operation: A, Co-Ordinating Rail and Oversea Carriers; B, Co-Ordinating Rail and Coastwise Carriers; Index.

## THE TWO BOOKS ON THE WATER SUPPLY OF THE CITY OF ROME

Of Sextus Julius Frontinus, Water Commissioner of the City of Rome, A. D. 97: A Photographic Reproduction of the Sole Original Latin Manuscript, and Its Reprint in Latin; Also a Translation into English, and Explanatory Chapters. By Clemens Herschel, President, Am. Soc. C. E. Second Edition. Cloth,  $11\frac{1}{2}$  x 8 $\frac{1}{2}$  in., illus., 24 + 23 + 296 pp. New York, London, Bombay, and Calcutta, Longmans, Green, and Co., 1913. \$6.50.

The first edition of this work was published in 1899, and this, the second, edition was issued in June, 1913. The object of the book, as stated in the Introduction, is to present for the edification of the Engineering Profession a translation of the

\* Unless otherwise specified, books in this list have been donated by the publishers.

work of Sextus Julius Frontinus, the study of which has been the author's pastime and hobby for a number of years. As stated in the title, the subject-matter consists of a photographic reproduction of the original manuscript which is in the Library of the Benedictine Monastery at Montecassino, Italy, where the author journeyed in 1897 to examine it. This is followed by the translation, the Latin and English being on opposite pages, of Frontinus' work which is a history of the conditions relative to the water supply of Rome, its sources, reservoirs, distribution systems, operation, maintenance, laws, etc. The translation is followed by explanatory chapters by the author, in which he describes and illustrates in detail, from the viewpoint of a hydraulic engineer, the work accomplished by Frontinus. The Contents are: Introduction; Photographic Reproduction of the Montecassino Codex; *Ivlii Frontini de Agris Urbis Romae Libri II*; The Two Books on the Water Supply of the City of Rome of (Sextus) Julius Frontinus; Index of Proper Names to the "II. Books"; Explanatory Chapters: Some Account of the Life and Works of Sextus Julius Frontinus; Springs, Wells, and Rain-Water Cisterns in Ancient Rome; Frontinus' Description of the Nine Aqueducts; Aqueduct Building, and the Waters of the Aqueducts; Measuring Water, A. D. 97; Hydraulics After Frontinus' Time; Arithmetic, A. D. 97, Among the Romans; The Distribution System; Operation; Maintenance and Repairs; The Law of Water-Rights in Rome, A. D. 97; The Character of the Water Commissioner; Sextus Julius Frontinus; Appendix to Chapter XI. (Water Rights); Index to Explanatory Chapters.

#### MASONRY DAM DESIGN

Including High Masonry Dams. By Charles E. Morrison and Orrin L. Brodie, M. Am. Soc. C. E. Second Edition, Revised and Enlarged. Cloth,  $9\frac{1}{2} \times 6$  in., illus., 9 + 276 pp. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1916. \$2.50.

The third-year students in the Department of Civil Engineering at Columbia University are required, it is stated, as part of their class work, to submit a design of a masonry dam, and as an aid in this problem they have been furnished, it is said, with copies of "Notes on the Theory and Design of High Masonry Dams", by William H. Burr, M. Am. Soc. C. E., which is based on the method of calculating the cross-sections of high masonry dams devised by Edward Wegmann, M. Am. Soc. C. E. In his treatment of the subject, however, Mr. Wegmann has omitted the effects of uplift, ice thrust, etc., on such dams, and in this book, it has been the aim of the authors to supply these omissions, together with a brief statement regarding recent investigations relative to more accurate determination of variations of stress in masonry dams. In this second edition the authors, it is said, have amplified some of the features which, in the first edition, were only touched on. Chapters on the Overfall and Arched types of masonry dams have been added, together with cross-sections of a selected series of masonry dams arranged chronologically for the purpose. It is stated, of comparison and to show the development of such dams from the massive Spanish type to that of the present. Low and medium-sized dams may also be designed, it is said, according to the theory and methods given, general expressions having been included whenever possible. The formulas relating to uplift, ice thrust, etc., have been used in part, it is stated, in connection with the design of the large dams for the new water supply of the City of New York and the computations for the design of high masonry dams are appended to facilitate the ready comprehension and application of the formulas presented. The Contents are: Upward Pressure and Ice Thrust; Preliminary Considerations; Development of Formulae; Investigation Formulae; The Design of a Masonry Dam; Weir or Overfall Type of Dam; The Arch Dam; Recent Considerations of the Condition of Stress in a Masonry Dam; Appendix I, Derivation of Cantilever Equations; Appendix II, Derivation of Arch Equations; Cross-Sections of Existing Masonry Dams; Index.

#### HYDRAULIC FLOW REVIEWED:

A Book of Reference of Standard Experiments on Pipes, Channels, Notches, Weirs, and Circular Orifices, Together with New Formulae Relating Thereto. By Alfred A. Barnes. Cloth,  $9\frac{1}{2} \times 6\frac{1}{2}$  in., illus., 11 + 158 pp. London, E. & F. N. Spon, Limited; New York, Spon & Chamberlain, 1916. \$4.50. (Donated by Spon & Chamberlain.)

The author having found, in his work, great diversity in the values of the coefficients generally used in discharge formulas, investigated the subject and made a series of experiments from which he evolved the new and simple formulas presented in this book. He has shown, it is stated, that, given the physical conditions, the value of the coefficient in his formulas depends only on the type or class of pipe, channel, etc., and does not vary with either dimensions or gradient, and

also that such a formula or equation can be found to fit, with great accuracy, every diameter and hydraulic gradient of pipe of any well-known size and every size and gradient of channel of fully described character. The tables in the second part of the book also show, it is said, that a similar equation or formula can be found, which represents with greater accuracy the flow through orifices, weirs, and notches. All the published experiments used for determining the author's formulas have been tabulated and are contained in the Appendices. The formulas are given at the head of the tables, and the calculated values corresponding to the experimental values have been scheduled, as well as the percentages of difference. Throughout the investigations, no assumptions whatever have been made, the author, it is said, having used only those results actually obtained in reliable experiments by various authorities, and, to that extent, the formulas must be regarded as empirical. Logarithms have been used in calculating the results and such use is described in detail in the text, a few examples being given on the plates at the end of the book. English measurements only have been used, and, in building up the formulas, graphical methods have been applied. A short list of standard books on the subject is included. The Contents are: Pt. I, Determination of the Coefficients in the Logarithmic Formula for the Flow of Water in Pipes and Channels; Pt. II, The Measurement of Water by Means of Triangular Notches, Weirs and Circular Orifices; The Abolishment of the Varying Coefficient; Triangular Notches; Rectangular Weirs, with Full End Contractions; Rectangular Weirs, without End Contractions; Formulae for the Two Types of Weirs Contrasted; Circular Orifices; Conclusion and Summary; Working Tables and Diagrams; Appendix: The Discharge of the Rochester Pipe Line in 1876; Index.

#### HYDRAULICS.

By R. L. Daugherty. Cloth,  $9\frac{1}{2} \times 6$  in., illus., 14 + 267 pp. New York and London, McGraw-Hill Book Company, Inc., 1916. \$2.50.

This book, it is stated, is intended primarily for students who are required to cover a wide field in hydraulics within a limited time. The author's main idea is, therefore, to present, it is said, only fundamental principles as clearly and concisely as possible. The arrangement and presentation of the subject-matter have been carefully considered with the view of connecting one part with another, and a number of diagrams and photographs have been used to illustrate the text in order, it is said, to give the student a clearer idea of the characteristics of the machines described. The treatment of the subject throughout the book is stated to be general, special cases being included only when necessary to illustrate some general principle or to make it clearer. The theory, general appearance, construction, and arrangement of turbines and centrifugal pumps are discussed, together with the principles of their operation, but discussion of their design has been omitted as not within the scope of this work. At the end of each chapter, the author has included problems, many of which have been taken, it is stated, from actual practice, and the solution of those involving the flow of water is made, it is said, to depend on applications of Bernoulli's theorem. Only sufficient information on experimental coefficients and empirical factors is included, it is stated, to give the student a correct idea of the range of values and the considerations which enter into the choice of a suitable value for a given case. The Chapter headings are: Introduction; Intensity of Pressure; Hydrostatic Pressure on Areas; Applications of Hydrostatics; Hydrokinetics; Applications of Hydrokinetics; Flow Through Pipes; Uniform Flow in Open Channels; Hydrodynamics; Description of the Impulse Wheel; Description of the Reaction Turbine; Water Power Plants; Theory of the Impulse Wheel; Theory of the Reaction Turbine; Turbine Laws and Factors; The Centrifugal Pump; Appendix: Tables; Index.

#### BRIDGE ENGINEERING.

By J. A. L. Waddell, M. Am. Soc. C. E. Cloth,  $9\frac{1}{2} \times 6$  in., illus., 2 v. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1916. \$10.00. (Donated by the Author.)

In these volumes which, it is stated, are in a certain sense a record of the author's lifework, it has been his aim to give all the information concerning every branch of bridgework, which he has been able to accumulate during a practice of 40 years. This work, it is stated, is not a new edition of the author's previous book, "De Pontibus," but portions of the latter, revised and brought up to date, have been included. He has also quoted freely from papers presented by himself before various scientific societies. The preface states that the work should prove useful to all engineers engaged in the design and construction of bridges, especially the younger and less experienced men, for not only are the principles of design described and illustrated, but such matters as loads, intensities, materials, esthetics, economics, and business methods, are treated exhaustively. Various tables and diagrams are also included, by which close estimates of costs may be made for

nearly every kind of bridge and of any length and size, regardless of the traffic carried. Data are also given for determining, at least approximately, the weights of metal required by the use of alloy steels of various elastic limits for spans of unprecedented width and length. The practical treatment of the various stresses for bridges is explained, as well as standard methods of computing for deflections and proportioning for camber. In connection with the statement of the first principles of design, their applications, etc., contained in Chapter XV, which, the author states, is the most important chapter in the book, the general detailing of all kinds of fixed spans is described. Movable spans are discussed only in a general and descriptive manner in Chapters XXVIII to XXXI, inclusive. The various methods of protecting the metal work of bridges are treated at length, as well as those for the protection of drawbridges, etc. In Chapter XXXVII, the practice of the design and construction of reinforced concrete bridges is described in detail, and specifications for such bridges are also included, but the theory is omitted, except certain formulas which have been established in the author's office, for the reason that the subject is fully discussed in various other books, the titles of which are given. All kinds of substructures, such as foundations, coffer-dams, piles, piers, etc., are described and illustrated in Chapters XXXVIII to XLV, inclusive, including specifications and explanations of how, when, and where to adopt the different types. Chapters XLVI to LI, inclusive, and Chapter LIV, are devoted to work preliminary to the actual design of bridges, such as surveys, borings, Government requirements, hydrographic surveys, etc., and the esthetics and true economy in design are fully discussed in Chapters LII and LIII. Quantities of materials of various kinds used in bridge construction are given in Chapters LV and LVI, and subsequent chapters (LVII, and LXVIII to LXX, inclusive) relate to the preparation of estimates, specifications, contracts, and reports. A thorough description of the various phases of office practice is given in Chapter LVIII, and, in Chapter LIX, the inspection of materials of all kinds is discussed in detail. Chapters LX to LXV, inclusive, cover all matters relative to field engineering, such as triangulation, erection, falsework, maintenance, repairs, etc. Preliminary to his chapter on Specifications, the author devotes Chapters LXVI and LXVII to the status of bridge building and bridge failures and their lessons. Chapters LXXI to LXXV, inclusive, relate to business matters connected with engineering, and the ethics of bridge engineering are discussed in Chapters LXXVI and LXXVII. Complete specifications governing the design of superstructures of all kinds for bridges, trestles, viaducts, and elevated railroads, with a clause index for computers, are given in Chapter LXXVIII, and Chapter LXXIX contains complete specifications governing the manufacture and erection of superstructures, substructures, approaches, and all accessory works for bridges, trestles, viaducts, and elevated railroads. There is also a clause index to this chapter to facilitate the use of the specifications. Chapter LXXX contains, it is said, the most complete glossary of technical terms used in bridgework, that has ever been compiled. In addition to the General Index, the author has given separate lists of the various illustrations and tables, arranged by chapter and number. Although not intended as a textbook for engineering students, it is stated that the volumes are well adapted to supplement the standard works used in the classroom, and they may also serve for general reference in technical and public libraries.

#### THE THEORY AND PRACTICE OF MODERN FRAMED STRUCTURES.

Designed for the Use of Schools and for Engineers in Professional Practice. By the Late J. B. Johnson, C. W. Bryan, and F. E. Turneaure, Members, Am. Soc. C. E. Part III, Design. Ninth Edition, Rewritten by F. E. Turneaure and W. S. Kinne. Cloth, 9 $\frac{1}{2}$  x 6 in., illus., 12 + 486 pp. New York; John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1916. \$4.00.

The preface states that this book is the third of a series of three volumes constituting a complete re-writing of "Modern Framed Structures," first published in 1893, and is intended primarily, it is said, as a textbook on bridge design, although some of the general features, it is hoped, may be of interest and value to the practicing engineer. In this edition, certain topics, such as those relating to building construction, elevated tanks, swing bridges, and trestles have been omitted, owing, it is stated, to the development and specialization in structural engineering. The subject-matter includes first a discussion of certain topics of fundamental importance in bridge design, which is covered in Chapters I to VII, inclusive. This is followed, in Chapters VIII to XI, by detailed analysis and design of the several structures, illustrating the principles discussed in the preceding chapters. There are also Appendices containing general specifications for steel railroad bridges, tables of frequently used standards, and a discussion of the mechanics of unsymmetrical bending. The Contents are: Styles of Structures and Determining Conditions; Working Stresses—Tension Members; Compression Members; Combined Direct and Bending Stresses—Secondary Stresses; Riveted Joints; Plate Girder Bridges; Design of Truss Bridges; Design of a Pin-Connected Railway Bridge;



Riveted Trusses; Design of a Riveted Highway Bridge; Design of Steel Roof Trusses; Appendix A, General Specifications for Steel Railway Bridges; Appendix B, Tables and Standards; Appendix C, Unsymmetrical Bending.

**ENGLISH AND AMERICAN TOOL BUILDERS.**

By Joseph Wickham Roe. Cloth,  $9\frac{1}{2} \times 6\frac{1}{2}$  in., 15 + 315 pp. New Haven, Yale University Press, 1916. \$3.00.

The purpose of this book, part of which has appeared in the *American Machinist*, is to bring out, the preface states, the importance of the work and influence of the great tool builders whose art has been fundamental to all modern industrial arts, for without machine tools, it is said, modern machinery could not be built. The author, it is stated, has tried to trace the origin and rise of tool building in America and describe something of its spread in recent years. He has confined himself, therefore, it is said, to the main lines of influence in tool building and to the personalities and cities which have been most closely identified with it. At the end of the book, there has been included a bibliography on Tool Building, and it is hoped that the volume will stimulate interest in the lives and work of the pioneer tool builders to whom the Engineering Profession owes so much. The Chapter Headings are: Influence of the Early Tool Builders; Wilkinson and Braham; Bentham and Brunel; Henry Maudslay; Inventors of the Planer; Gearing and Millwork; Fairbairn and Bodmer; James Nasmyth; Whitworth; Early American Mechanics; The Rise of Interchangeable Manufacture; Whitney and North; The Colt Armory; The Colt Workman—Pratt & Whitney; Robbins & Lawrence; The Brown & Sharpe Manufacturing Company; Central New England; The Naugatuck Valley; Philadelphia; The Western Tool Builders; Appendix A; Appendix B, The Jennings Gun; A Partial Bibliography on Tool Building; Index.

#### INDUSTRIAL USES OF FUEL OIL.

By F. B. Dunn. Cloth,  $8\frac{1}{2} \times 5\frac{1}{2}$  in., illus., 235 pp. San Francisco, Technical Publishing Company, 1916. \$3.00.

This book, it is stated, is intended to be a practical exposition of the use of fuel oil for various industrial purposes, and has been written for the use of practical men. The subject-matter contains, it is said, brief descriptions of many of the manufacturing processes in which oil may be used as fuel, and these descriptions are followed, in each case, by detailed directions for furnace and boiler arrangement as well as approved methods of operation. From a study of the text, the engineer, architect, plant superintendent, manager, fuel oil salesman, and efficiency expert should be able to judge, it is said, as to the applicability of fuel oil to their purposes, and Chapters XVI and XVII, on Furnace Efficiency and Tests, in which descriptions of how boiler losses may be checked and true efficiency determined, should prove of value, it is stated, to operating engineers. The Contents are: Oil as a Fuel; Oil Storage and Pumping Systems; Boiler Furnace Arrangement; Oil Burners; Oil Strainers and Heaters; Oil in the Clay, Lime and Cement Industries; Oil in the Glass Industry; Oil Burning Locomotives; Oil in the Sugar and Rubber Industries; Smelting Furnaces Fired with Oil; Metallurgical and Shop Furnaces; Oil in the Steel Industry; Fuel Oil for Naval and Maritime Purposes; Fuel Oil for Domestic Purposes; The Rotary System of Burning Oil; Furnace Efficiency and Combustion; Tests and Reports; Oil for Gas Making; Index.

#### CONCRETE CONSTRUCTION FOR RURAL COMMUNITIES.

By Roy A. Seaton. (Agricultural Engineering Series.) Cloth,  $8\frac{1}{2} \times 5\frac{1}{2}$  in., illus., 11 + 223 pp. New York and London, McGraw-Hill Book Company, Inc., 1916. \$2.00.

Most of the books on concrete construction now available have been written, it is stated, for the engineer, or are in the form of bulletins dealing chiefly with the uses to which concrete can be put in rural communities, without including a systematic treatment of the fundamental principles governing such use. The extension of the use of concrete to farms and rural communities generally, has made a knowledge of its valuable properties and the proper methods of using it highly desirable, and has developed, it is said, a need for a textbook, such as this volume, which treats of the essential features of concrete construction in a thorough but simple manner. In preparing this volume, the author, it is stated, has endeavored to make it suitable for use as a textbook in a brief course on concrete construction for agricultural and other students when accompanied by laboratory exercises and field construction, and, for that reason, he has included Chapter II, on Cement Specification and Tests, and Chapter VIII, on Strength of Reinforced Concrete, which are not necessary to the use of the non-technical workman. The Contents are: Introduction; Part I, Materials: Cements and Limes; Cement Specifications



and Tests; Aggregates. Part II, Plain Concrete: Proportions and Quantities of Materials; Construction of Forms; Mixing and Handling Concrete. Part III, Reinforced Concrete: General Principles; Strength of Reinforced Concrete. Part IV, Miscellaneous Matters: Concrete Surface Finishes; Stucco and Plaster Work; Waterproofing and Coloring Concrete; Casting in Molds. Part V, Typical Applications of Concrete: Sidewalks, Floors and Roads; Tanks, Cisterns, and Silos; Small Highway Bridges and Culverts; Index.

#### THE ENGINEER IN WAR

With Special Reference to the Training of the Engineer to Meet the Military Obligations of Citizenship. By P. S. Bond, M. Am. Soc. C. E. Reprinted, with Revisions and Additions, from the *Engineering Record*. Roan,  $7\frac{1}{2} \times 5$  in., illus., 15 + 187 pp. New York, McGraw-Hill Book Company, Inc.; London, Hill Publishing Co., Ltd., 1916. \$1.50.

In presenting this volume to the Engineering Profession, the author, it is said, does not intend to provide a treatise on military field engineering, on which subject many textbooks and manuals have been written. The subject-matter of this book consists, as stated, of a brief outline of the relation of engineering to the conduct of war and the adaptation of the principles and practices of civil engineering thereto. Although intended primarily for the engineer and contractor, it is hoped that the volume may prove of interest to all who contemplate serving their country in case of need. There is included a bibliography on military subjects issued by the United States War Department, to which has been added a list of textbooks, and there is also a glossary of military terms used in the text. The Contents are: The Military Policy of the United States; General Duties of the Military Engineer and Economics of Military Engineering; Tools and Equipment Employed in Military Engineering; Stream Crossings; Military Roads; Field Fortification and Siege Operations; Military Demolitions; Military Reconnaissance, Sketching, and Surveying; Military Sanitation; The Mobilization of Material Resources; How May the Engineers and Contractors of America Prepare to Meet the Military Obligations of Citizenship?; Bibliography; Glossary of Terms; Index.

#### THE AMERICAN ROAD:

A Non-Engineering Manual for Practical Road Builders, Treating of the Construction, Administration, and Economics of Improved Earth Roads. By James I. Tucker. Cloth,  $7\frac{1}{2} \times 5$  in., illus., 12 + 235 pp. Norman, Okla., The Author, 1916.

The preface states that this book has a double purpose, namely, to present to the non-technical reader the simple facts which underlie and are essential to sound road work, particularly in the development of country roads in the United States, and to furnish material for a brief correspondence course for road-builders. The subject-matter deals, it is said, wholly with "cheap" roads, but the necessity of applying sound engineering principles to such roads is emphasized. Road economics and administration and the convict question are briefly considered, followed by a short discussion on location, grades, drainage, etc. Methods of construction and maintenance of earth, sand-clay, "top-soil", and gravel roads, as developed in the various States, are discussed in detail, with their costs, as well as the materials which have been used successfully in such roads. There is also an outline treatment and elementary discussion of such road structures as larger culverts and bridges, and a chapter on legislation in which the legislative steps necessary to the most economical expenditure of public money on public roads. The author, it is said, hopes that this book will prove helpful to engineers, county boards, county commissioners and other road officials and that it will lead to the construction and maintenance of the greatest number of good roads at the least possible cost. The contents are: General Conditions and Preliminary Studies; Road Economics; Road Administration; Convicts and Road Work; Earth Road Construction; Cost Accounting and Earthwork; Earth Road Maintenance; Waterways; Bridges; Road Finance; Stone Roads; Gravel Roads; Sand-Clay Roads; Road-Building with Oils; Needed Legislation; Index.

#### CITY PLANNING:

A Series of Papers Presenting the Essential Elements of a City Plan. Edited by John Nolen. (National Municipal League Series.) Cloth,  $7\frac{1}{2} \times 5\frac{1}{2}$  in., illus., 26 + 447 pp. New York and London, D. Appleton and Company, 1916. \$2.00.

Although some attention is devoted to problems of municipal organization and administration in their relations to city planning, this book, it is stated, is con-

cerned primarily with the nature, purposes and methods of such planning. The subject-matter consists of a collection of essays on the subject by sixteen men of recognized knowledge and practical experience in that particular part of city planning of which they write. These essays, it is said, form a carefully related series which, taken together, cover the essential elements of a city plan, presenting a convenient summary of American practice and an embodiment of good methods and practice in such work. At the end of each chapter there is appended a selected list of books and articles on the subject discussed, and, at the end of the book, there is a brief bibliography of the most authoritative works and papers on the subject of city planning as a whole. The text is fully illustrated, and, following the preface, are brief biographical sketches of the contributors. The Contents are: Introduction, by Frederick Law Olmsted; the Subdivision of Land, by John Nolen; Public Control of Private Real Estate, by Frank Backus Williams; Local and Minor Streets, by Edward Henry Rounton; Public Buildings and Quasi-Public Buildings, by Edward H. Bennett; Neighborhood Centers, by Arthur Coleman Comey; General Recreation Facilities, by J. Horace McFarland; Park Systems, by John Nolen; Water Supply and the City Plan, by Caleb Mills Saville; Non-Navigable Waters, by Arthur A. Shurtleff; Navigable Waters, by E. P. Goodrich; Railroads and Industrial Districts, by George R. Wadsworth; Transportation and Main Thoroughfares and Street Railways, by Benjamin Antrim Haldeman; The Effect of Rapid Transit on the City Plan, by John Vipond Davies; Residential and Industrial Decentralization, by James Ford; Fundamental Data for City Planning Work, by George Burdett Ford; City Financing and City Planning, by Flavel Shurtleff; City-Planning Legislation, by Charles Mulford Robinson; General Bibliography; Index.

#### THEORY OF ERRORS AND LEAST SQUARES:

A Textbook for College Students and Research Workers. By LeRoy D. Weld. Cloth,  $7\frac{1}{2} \times 5$  in., illus., 12 + 190 pp. New York, The Macmillan Company, 1916. \$1.25.

Few branches of mathematics, it is stated, have wider applicability to general scientific work than the Theory of Errors and there are few mathematical implements capable of greater usefulness to the research worker than the Method of Least Squares, but the student, it is said, is rarely given the opportunity of acquiring facility along these lines. This volume, the preface states, embodies material used by the author, as lecture notes during the last 12 years, and the subject is presented herein; it is said, in such a simple and concise form as to be useful not only as a textbook for the student but also as a handy reference for the research worker. The illustrative examples and problems contained in the text are drawn from various branches of science, suggesting, it is said, a wide range of possible application, but no attempt has been made at an exhaustive treatment. Some of the special methods used by expert computers have been omitted purposely, it is stated, and a few of the more complicated mathematical discussions are included in the Appendix for the convenience of the student, and referred to in the text. The Chapter headings are: On Measurement; On the Occurrence and General Properties of Errors; On Probabilities; The Error Equation and the Principle of Least Squares; On the Adjustment of Indirect Observations; Empirical Formulas; Weighted Observations; Precision and the Probable Error; Appendix; Supplementary Notes.

#### OXY-ACETYLENE WELDING AND CUTTING

Electric, Forge and Thermit Welding, Together with Related Methods and Materials Used in Metal Working and the Oxygen Process for Removal of Carbon. By Harold P. Manly. Cloth,  $6\frac{1}{2} \times 4\frac{1}{2}$  in., illus., 215 pp. Chicago, Frederick J. Drake & Co., 1916.

As stated in the secondary title, the author's aim, in this book, has been to cover not only the several processes of welding, but also other and closely allied processes which form a part of the subject of joining metal to metal with the aid of heat. He has also discussed, it is said, other operations which precede or follow the actual joining of the metal parts, the purpose of which is to add or retain certain desirable qualities in the materials being handled, such as annealing, tempering, hardening, heat treatment, and the restoration of steel. Much practical information is also given, it is stated, on the uses and characteristics of the various metals, on the production, handling, and use of the gases and other materials which are part of the equipment, and on the tools and accessories for the production and handling of these metals. All theoretical, historical, and similar matter not absolutely necessary to the practical workman, has been eliminated, it is said, the descriptions being limited to present-day methods and practice, including the application of the rules laid down by insurance underwriters governing this work, as well as instructions for the proper care and handling of generators, torches, and materials found in the shop. Although the volume is small in size, the

practical workman, it is stated, will find all the data necessary to a knowledge of both principle and practice, preparation and finishing of the work, of both large and small repair work, and of the manufacturing methods used in metal working. The Contents are: Metals and Alloys-Heat Treatment; Welding Materials; Acetylene Generators; Welding Instruments; Oxy-Acetylene Welding Practice; Electric Welding; Hand Forging and Welding; Soldering, Brazing, and Thermit Welding; Oxygen Process for Removal of Carbon; Index.

#### MACRAE'S BLUE BOOK, 1916:

America's Greatest Buying Guide. Cloth, 11½ x 8½ in., illus., various pagings. Chicago and New York, MacRae's Blue Book Company, 1916. \$10.00.

In a secondary title, it is stated that this book is used by the mechanical, engineering, and purchasing departments of the steam and electric railways of North America, by mines, contractors, iron and steel industries, municipalities, shipbuilders, the United States and foreign Governments, and others. The subject-matter consists of a Catalogue Section in which the catalogues of various manufacturers have been collated in condensed form; an Address Section containing an alphabetical list of firms advertising in this book and also an alphabetical list of their representatives; a Classified Material Section in which are listed in alphabetical order, under 9000 classifications, the names and addresses of various manufacturers of railway supplies, iron and steel products, and building construction materials; a Trade Name Section arranged alphabetically; a Miscellaneous Data Section which is preceded by an alphabetical index, containing rules and tables of special interest to the man who specifies or buys railway and building materials, or iron and steel products; a Standard List Price Section, also preceded by an alphabetical index, containing standard list prices for building materials and iron and steel products; and a Net Discount Computer.

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**Good Roads Year Book, 1916.** Fifth Edition. American Highway Association, Washington, D. C.

**The Construction of Gas Works Practically Described.** By Walter Ralph Herring. London, 1892.

**Coal and Coke.** By Frederick H. Wagner. New York, 1916.

**A Manual for Health Officers.** By J. Scott MacNutt, with a Foreword by William T. Sedgwick. New York, 1915.

**Geology.** By Thomas C. Chamberlin and Rollin D. Salisbury. 3 Vol. New York, 1909.

**English Public Health Administration.** By B. S. Bannington; Introduction by Graham Wallas. London, 1915.

**The Practical Design of Steel-Framed Sheds.** By Albert S. Spencer. New York, 1915.

**Harper's Hydraulic Tables for the Flow of Water in Circular Pipes Under Pressure, Timber Flumes, Open Channels, and Egg-Shaped Conduits, with Much Accessory Information.** By Joseph Harper. New York and London, 1916.

**The Sampling and Chemical Analysis of Iron and Steel.** By O. Bauer and E. Deiss. Authorized Translation from the German, by William T. Hall and Robert S. Williams. New York and London, 1915.

**Liquid Air, Oxygen, Nitrogen.** By Georges Claude. English Edition Corrected and Brought up to Date by the Author. Translated by Henry E. P. Cottrell, with a Preface by D'Arsonval. London, 1913.

**The Metallography and Heat Treatment of Iron and Steel.** By Albert Sauveur. Second Edition. Cambridge, Mass., 1916.

**The Principles and Practice of Iron and Steel Manufacture.** By Walter Macfarlane. Third Edition. New York and London, 1912.

**Flight Without Formulae:** Simple Discussions on the Mechanics of the Aeroplane. By Commandant Duchene. Translated from the French by John H. Ledeboer. New York and London, 1914.

**The Testing of Materials of Construction:** A Text-Book for the Engineering Laboratory and a Collection of the Results of Experiment. By William Cawthorne Unwin. Third Edition. New York and London, 1910.

**The Telephone and Telephone Exchanges:** Their Invention and Development. By J. E. Kingsbury. New York and London, 1915.

**Factory Administration and Accounts:** A Book of Reference with Tables and Specimen Forms, for Managers, Engineers, and Accountants. By Edward T. Elbourne. With Contributions on the General Problem of Industrial Works Design by Andrew Home-Morton and Financial Accounts by John Maughfling. New York and London, 1914.

**An Introduction to the Study of Physical Metallurgy.** By Walter Rosenhain. New York, 1915.

**Institution of Mining and Metallurgy:** Transactions; Vol. 24; 1914-15. London, 1915.

**The Plenum or Propulsion System of Heating and Ventilation.** By Harold Griffiths. London.

**Autogenous Welding and Cutting.** By Theodore Kautny. Translated by the Author and James F. Whiteford. New York and London, 1915.

**Poor's Manual of Public Utilities, 1916:** Street Railway, Gas, Electric, Water Power, Telephone and Telegraph Companies. Fourth Annual Number. New York.

**Railway Expansion in Latin America:** Descriptive and Narrative History of the Railroad Systems of Argentina, Peru, Venezuela, Brazil, Chile, Bolivia, and All Other Countries of South and Central America. By Frederic M. Halsey. New York, 1916.

**Wireless Telegraphy.** By J. Zenneck. Translated from the German by A. E. Seelig. New York and London, 1915.

**Forschungsarbeiten auf dem Gebiete des Ingenieurwesens.** Herausgegeben vom Verein Deutscher Ingenieure. Heft 183. Berlin, 1916.

**Chemistry in the Service of Man.** By Alexander Findlay. New York and London, 1916.

**American Society of Municipal Improvements:** Proceedings of the Twenty-Second Annual Convention Held at Dayton, Ohio, October 12th, 13th, 14th, and 15th, 1915. Indianapolis, 1916.

**Public Utilities Reports Annotated, 1916 B:** Containing Decisions of the Public Service Commissions and of State and Federal Courts. Rochester, N. Y.

**Digest of Public Utilities Reports Annotated for the Year 1915,** including Vol. 1915 A-1915 F. Rochester, N. Y., 1916.

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ANDREWS, ROBERT EDMUND. Hydr. Engr., Committee on Fire Prevention, National Board of Fire Underwriters, 606 Grant Pl., Bay City, Mich.....	Assoc. M. M.	Jan. 2, 1912 June 24, 1916
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ELLIS, NATHAN RANDALL. Valuation Engr., City Attor- ney's Office, 1176 Dolores St., San Francisco, Cal.			June 23, 1916
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(Dana W. Robbins, Inc.), 376 Genesee	Assoc. M.	Oct. 3, 1906
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Dept., Standard Oil Co. of New York,	Assoc. M.	June 24, 1914
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TOLL, ROGER WOLCOTT. Chf. Engr., The Den-	Jun.	Oct. 5, 1909
ver Tramway Co., 790 Washington St.,	Assoc. M.	Nov. 12, 1913
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ABBOTT, WALTER RUSSELL. Constr. Engr., with Keith O. Guthrie, 2 Cornelius Ave., Schenectady, N. Y.		April 18, 1916
ACKERMAN, ARTHUR POPE. Great Barrington, Mass.	Jun.	June 30, 1910
AUSTILL, HURIOSCO. Bridge Engr., Mobile & Ohio R. R., Mobile, Ala.	Assoc. M.	April 18, 1916
BALDWIN, THOMAS ABBOTT. Res. Engr., The Pennsylvania Steel Co., Box 2221, De Soto Station, Memphis, Tenn.	Jun.	July 9, 1912
BATES, CLARENCE MYERS. Structural Engr., Pacific Dist., Interstate Commerce Comm., 731 Wells Fargo Bldg., San Francisco, Cal.	Assoc. M.	May 31, 1916
BAVER, WALTER SAMUEL. Asst. San. Engr., City of Johnstown, 401 Association Pl., Johnstown, Pa.	Jun.	Feb. 4, 1913
BAYLIS, JOHN ROBERT. Mgr., Jackson Water Works, Jackson, Miss.	Assoc. M.	May 31, 1916
BELL, JOHN WILSON. 622 Ellis Ave., Ashland, Wis.		Dec. 6, 1915
BLASER, ARTHUR FREDERICK. 10003 Newton Ave., Cleveland, Ohio.		May 31, 1916
BOGGESS, LOUIS STERLING. Dist. Engr., Bureau of Public Works, Naga, Ambos Camarines, Philippine Islands.		Mar. 14, 1916
BOLDT, JOHN. Gen. Supt., The Samuel Austin & Son Co., 1108 Sweetland Bldg., Cleveland, Ohio.		May 31, 1916
BOWLBY, HENRY LEE. Care, Home Telephone & Telegraph Co., Portland, Ore.		Mar. 14, 1916
BOYNTON, ROBERT HAMMOND. City Engr., Frankfort, Ind.	Jun.	May 6, 1914
BROWN, FRED MELVIN. County Surv., Gallatin County; Engr. for Manhattan, Bozeman, Mont.	Assoc. M.	April 18, 1916
BUCKWALTER, HARRIS DANIEL. Asst. Engr. Public Service Comm. of Pennsylvania, Box 44, Harrisburg, Pa.		May 31, 1916
BUELL, WILLIAM ELIJAH, JR. Asst. Engr., Ambursen Hydr. Constr. Co. of Canada, Ltd., and Raymond Concrete Pile Co., 756 Sherbrooke St., West, Montreal, Que., Canada.	Jun.	June 24, 1914
CHANDLER, JOHN HENRY. Box 55, Bartlesville, Okla.	Assoc. M.	April 18, 1916
CHASE, EDWARD SHERMAN. Asst. Engr. New York State Dept. of Health, Albany, N. Y.		June 23, 1916
CHILDS, JAMES ALANSON. Engr., Div. of Sanitation, State Board of Health, 1988 Summit Ave., St. Paul, Minn.		May 31, 1916
CISSEL, JAMES HARLAN. Instr. in Civ. Eng., Univ. of Michigan, 1213 S. State St., Ann Arbor, Mich.		April 18, 1916
		May 31, 1916

## ASSOCIATE MEMBERS (Continued)

Date of  
Membership.

CLEVELAND, JOHN ABELL. Chf. Engr. and Director Genl, Constr. of the Ferrocarril á la Costa, Box 197, Guayaquil, Ecuador.....		Mar. 14, 1916
CORLETT, WILLIAM GREENFIELD. Draftsman and Engr., Walter D. Reed, Oakland Bank of Savings Bldg., Oakland, Cal..	Jun. Dec. 2, 1914 Assoc. M. May 31, 1916	
COTTRELL, FREDERICK WILLIAM. Engr., Melville Irrig. Co., Deseret Irrig. Co., and Sevier Land & Water Co., Delta, Utah.....		May 31, 1916
CROOKES, HAROLD JOSEPH. 2 West 16th St., New York City.		May 31, 1916
DIMMLER, CHARLES LOUIS. Structural Engr., Div. of Valuation, Interstate Commerce Comm., 1330 Josephine St., Berkeley, Cal.....	Jun. Oct. 1, 1907 Assoc. M. April 18, 1916	
DODGE, FRANK EARLE. Supt. of Maintenance, New York & New England Cement & Lime Co., 502 Clinton St., Hudson, N. Y.	Jun. Feb. 4, 1913 Assoc. M. June 23, 1916	
ELTINGE, ORVILLE LAMONT. Asst. Engr., E. B. Murray & Co., Kansas City, Mo.....	Jun. Jan. 3, 1907 Assoc. M. May 31, 1916	
FAIDLEY, LLOYD HARRISON. 4812 Hammett Pl., St. Louis, Mo.....	Jun. Dec. 5, 1911 Assoc. M. May 31, 1916	
FAWCETT, LUTHER THOMAS. First Asst. City Engr., 365 Carroll St., Youngstown, Ohio.....		June 23, 1916
FORSTER, ALEXANDER SYLVESTER. Chf. Draftsman, Toledo Bridge & Crane Co., 2603 Franklin Ave., Toledo, Ohio.....		May 31, 1916
FOSTER, WALTER LINDER. Care, Kennecott Copper Cor- poration, Latouche, Alaska.....		May 31, 1916
FOX, WILLIAM FREDERICK. Asst. to Rd. Engr., I. R. T. Co., M. of W. Dept., 32 Walnut Ave., Rockville Center, N. Y.....	Jun. April 5, 1910 Assoc. M. April 18, 1916	
FRASER, LEE. (South American Eng. Corporation), 52 Wil- liam St., New York City.....		April 18, 1916
FRAZIER, FORREST FAYE. Asst. Prof. of Civ. Eng., Kansas State Agricultural Coll., Manhattan, Kans.....		May 31, 1916
FRICK, ORLANDO HENRY. 686 Murray Ave., Milwaukee, Wis.		Jan. 17, 1916
FRIEDMAN, HARRY BAYARD. Supt., W. E. Wood Co., Chev- rolet Motor Co. Plant, Fort Worth, Tex.....		Mar. 14, 1916
FROST, EDWARD MURRAY. 7 Elbridge St., Worcester, Mass.....	Jun. June 24, 1914 Assoc. M. June 23, 1916	
GILLIS, RIDGWAY MILLS. Asst. Engr., State Highway Dept., Kalama, Wash.....		April 18, 1916
GOODMAN, FRANK RAYMOND. Dist. Engr., State Highway Dept., Parks, Ariz.....		June 23, 1916

ASSOCIATE MEMBERS (Continued)		Date of Membership.
GRAY, HAROLD FARNSWORTH. City Health Officer, 208 Ramona Bldg., Palo Alto, Cal.	Jun. Assoc. M.	Jan. 4, 1910 Mar. 14, 1916
GUINOTTE, JOHN. Asst. Engr., M. of W., C., M. & St. P. Ry., Milwaukee Freight House, Seattle, Wash.		June 23, 1916
HALLETT, JAMES HENDRICKS. Chf. Clerk, Jacksonville Eng. Dept., Jacksonville, Fla.		June 23, 1916
HARDESTY, SHORTRIDGE. Asst. Engr., Waddell & Son, 800 Graphic Arts Bldg., Kansas City, Mo.	Jun. Assoc. M.	Sept. 1, 1908 Mar. 14, 1916
HASKINS, CHARLES ARTHUR. Engr., Kansas State Board of Health, Lawrence, Kans.		June 23, 1916
HEERLEIN, ROBERT WILLIAM. Asst. Engr., Estimating and Designing Dept., McClintic-Marshall Co., P. O. Box 418, Pittsburgh, Pa.		May 31, 1916
HEILBRONNER, LEON COHEN. Engr. and Mgr., Eastover Constr. Co., Inc., Box 242, Utica, N. Y.	Jun. Assoc. M.	Mar. 2, 1909 May 31, 1916
HERZIG, SOLOM. 472 West End Ave., New York City	Jun. Assoc. M.	Oct. 1, 1913 June 23, 1916
HEWETT, FREEMAN REGINALD. Constr. Engr. of Adams County; City Engr., Ritzville, Wash.		June 23, 1916
HIESIGER, CHARLES MILTON. Examining Insp. in Office, Commr. of Accounts, Consultant with Phoenix Eng. Co., 5 Beekman St., New York City		June 23, 1916
HINGSBURG, FREDERICK CHARLES. Care, Mr. Lyons, Box 36, Kingston, Jamaica		May 31, 1916
HIBAI, KIKUMATSU. Care, Yamanaka & Co., 254 Fifth Ave., New York City	Jun. Assoc. M.	Dec. 5, 1911 May 31, 1916
HOCHENEDEL, CHARLES ANTHONY. City Civ. Engr., Fremont, Ohio		May 31, 1916
HORTON, CHARLES KAAPKE. Gen. Contr. (Horton & Horton), Houston, Tex.		June 23, 1916
HOWLAND, LEON DAVID. County Engr., Union County, La Grande, Ore.	Jun. Assoc. M.	Feb. 4, 1914 May 31, 1916
HUIE, IRVING VAN ARNAM. Asst. Engr., F. A. Molitor, 223 East 31st St., New York City	Jun. Assoc. M.	May 7, 1913 May 31, 1916
HUNTER, HARRY GRIFFITH. 1024 North Liberty St., Independence, Mo.		May 31, 1916
HUTTON, MURRAY LEE. County Engr., Des Moines County Court House, Burlington, Iowa		June 23, 1916
IAKTSCH, JOHN RUDOLPH. Constr. Engr. on Drainage U. S. Reclamation Service, Powell, Wyo.		April 18, 1916

## ASSOCIATE MEMBERS (Continued)

Date of  
Membership.

IBARGÜEN Y PI, ALBERTO ANGEL. Provisional Chf. Engr. of Public Works, District of Pinar del Rio, Marti 47, Pinar del Rio, Cuba.	June 23, 1916
IBARRA CEREZO, JOSÉ MARIA. Director of Dept. of Ways and Communications, Ministry of Public Works, Sur 5, No. 157, Caracas, Venezuela.	June 23, 1916
JESSOP, GEORGE AUGUSTUS. Care, S. Morgan Smith Co., York, Pa.	May 31, 1916
KAESTNER, ALBERT CARL. Asst. to Chf. Engr., U. S. Realty & Impvt. Co., 949 Broadway, Room 702 (Res., 2216 Starling Ave.), New York City.	Jun. 2, 1912 Assoc. M. May 31, 1916
KELLY, HUGH AMBROSE. Engr., Dept. of Parks and Public Property, City Plan Engr., 33 Baldwin Ave., Jersey City, N. J.	Jun. Oct. 29, 1912 Assoc. M. May 31, 1916
KRAUSE, MARK CHAMPION. 335 Pine St., Williamsport, Pa.	May 31, 1916
LANDER, ROSWELL SEARS. Associate Engr. with Soper Eng. Co., Winchester, Tenn.	Jan. 17, 1916
LANGLEY, JOHN EDWARD. Supt. of Constr., Treasury Dept., Southport, N. C.	Mar. 14, 1916
LEE, ALONZO CHURCH. Care, Knight & Quayle, 408 Times Bldg., Chattanooga, Tenn.	June 23, 1916
LEHFELT, WALT FERD. Care, International Boundary Comm., Malvina, Que., Canada.	April 18, 1916
LILLY, RIDGELY CASEY. U. S. Junior Engr., Box 404, Vicksburg, Miss.	Jun. Oct. 5, 1909 Assoc. M. April 18, 1916
LUTHER, HERBERT LAWRENCE. Care, Missouri Val. Bridge & Iron Co., Boise, Idaho.	May 31, 1916
MCENTIRE, LLOYD. Div. Highway Engr., State Rd. Dept., 224 North Warren St., Trenton, N. J.	Jun. Sept. 2, 1914 Assoc. M. May 31, 1916
MANLEY, HENRY, JR. Asst. Engr., Public Service Comm., 1594 Hayes Ave., Elmhurst, N. Y.	May 31, 1916
MEISTER, FREDERICK. Chf. Draftsman and Designing Engr., The Hinkle Iron Co., 309 High St., West Hoboken, N. J.	June 23, 1916
MILLER, HAROLD BROWN. Asst. Engr., Designing and Estimating Depts., McClintic-Marshall Co., 1217 Oliver Bldg., Pittsburgh, Pa.	June 23, 1916
MILLER, HAROLD EDMUND. 29 Elma St., Providence, R. I.	Jun. Oct. 1, 1907 Assoc. M. May 31, 1916
MILLER, WILLIAM FRANKLIN. Superv., Office of Valuation Engr., P. R. R., Commercial Trust Bldg., Philadelphia, Pa.	May 31, 1916
MOLLARD, CHARLES ELIAS. Cons. Engr., Park Ridge, Ill.	May 31, 1916



ASSOCIATE MEMBERS (Continued)		Date of Membership.
NORTH, ROBERT GASTON.	60 Springside Ave., Pittsfield, Mass.	Dec. 6, 1915
PANZER, ROBERT RUDOLPH.	Chf. Engr., Dept. of Bldgs., 515 Hawthorne Ave., Cincinnati, Ohio.	May 31, 1916
PARSONS, HAROLD FRANK.	Res. Engr., George W. Fuller, Thomson Bldg., Huntington, N. Y.	May 31, 1916
PAULS, ARTHUR LEONARD.	Irrig. Engr., Gen. Land Office, Box 336, Cheyenne, Wyo.	May 31, 1916
PEARCE, HARRY ASH.	Engr. and Contr. (Pearce & Sexton), Ancon, Canal Zone, Panama.	April 18, 1916
PIENIE, HERBERT MALCOLM.	112 Magnolia Terrace, Springfield, Mass.	Feb. 4, 1914
PURTON, ASTLEY BLOXAM.	Asst. Engr., U. S. Geological Survey, 421 Federal Bldg., Salt Lake City, Utah.	June 23, 1916
RANKIN, CARL ROY.	Locating Engr. for City and County of San Francisco Hetch Hetchy Water Supply, Groveland, Cal.	May 31, 1916
RASMUSSEN, BERNHARD.	Asst. Engr., Santo Domingo Obras Publicas, La Vega, Santo Domingo, Dominican Republic.	June 23, 1916
RINDSFOOS, CHARLES SIESEL.	Pres., U. S. Purchasing Corporation, Room 1689, Woolworth Bldg., New York City.	April 18, 1916
ROBERTS, BURKE BROCKWAY.	Asst. Engr., James L. Stuart, 917 Illuminating Bldg., Cleveland, Ohio.	Jun. April 2, 1907 Assoc. M. May 31, 1916
ROBY, HARRISON GEORGE.	Gen. Mgr., City of Alpena, National Bank Bldg., Alpena, Mich.	Jun. Dec. 2, 1914 Assoc. M. May 31, 1916
ROHR, WILKIE CLAIBORNE.	Engr., T. C. Thompson & Bros., Box 97, Charlotte, N. C.	May 31, 1916
ROUSE, HERBERT MILTON.	Supt., Val. Div., California Development Co., Calexico, Cal.	May 31, 1916
RUMSEY, WILLIAM MILO.	Room 529, Granger Blk., San Diego, Cal.	Nov. 3, 1915
SANDSTON, LEONARD MARK.	17 Gramercy Park, New York City.	May 31, 1916
SANDSTROM, ARTHUR CHARLES.	Care Constr. Dept., Braden Copper Co., Rancagua, Chili, via Colon and Valparaiso.	May 31, 1916
SCHOLTZ, HERMAN FRED.	Care, Moses, Pope & Messer, Inc., 366 Fifth Ave., New York City.	Jun. Oct. 30, 1906 Assoc. M. April 18, 1916
SMITH, EVERETT CLERC, JR.	Point Pleasant, W. Va.	April 18, 1916
SMITH, GEORGE WASHINGTON.	1828 Lytton Bldg., Chicago, Ill.	Jun. Jan. 31, 1911 Assoc. M. June 3, 1915

## ASSOCIATE MEMBERS (Continued)

		Date of Membership.
SMITH, SCHUYLER MORTON. In Chg., Bridge Dept., Drafting Room, Wabash Ry., 1467 Ry. Exchange Bldg., St. Louis, Mo.....		May 31, 1916
SORTORE, ARTHUR EMERSON. Asst. Engr., Div. of Bridges, Bureau of Eng., Benton Ave. and Atkins St., Pitts- burgh, Pa.....		May 31, 1916
SPENGLER, JOHN HENRY. With Westinghouse, } Church, Kerr & Co., 37 Wall St., New } Jun. June 6, 1911 York City..... } Assoc. M. May 31, 1916		
STARK, BURE MANLOW. 30th and Spruce Sts., Philadelphia, Pa.....		May 31, 1916
STOWE, HENRY DANIELS. Pilot Engr., Valuation Dept., P. R. R., 534 Commercial Trust Bldg., Philadelphia, Pa.....		June 23, 1916
SWETT, WILLIAM CLAUDE. 3602 Windsor } Jun. Nov. 1, 1910 Ave., Kansas City, Mo..... } Assoc. M. Mar. 14, 1916		
TAIT, WILLIAM STUART. Chf. Engr., Concrete Steel Pro- ducts Co., 855 McCormick Bldg., Chicago, Ill.....		May 31, 1916
THOMSEN, SAMUEL LOCKE. Res. Engr. and Supt., The E. H. Close Realty Co., 2860 Scottwood Ave., Toledo, Ohio.		May 31, 1916
THORPE, JOHN EDWARD STIRLING. Res. Engr., Aluminum Co. of America, Care, Talassee Power Co., Whitney, N. C.....		May 31, 1916
TOMLINSON, WILLIAM SIDNEY. Engr., Shand } Jun. Sept. 3, 1912 Eng. Co., 1002 Loan and Exchange } Assoc. M. Dec. 6, 1915 Bldg., Columbia, S. C.....		
TRACY, HERBERT HERMAN. City Engr., Norfolk, Nebr.....		April 18, 1916
TRUSCOTT, STARR. Birmingham, Ohio.....		May 31, 1916
TURNER, HOMER ROOT. Supt., Windsor Fire Dist., Windsor, Conn.....		Mar. 14, 1916
UPSON, WARREN WILLIAM. Bldg. Contr. (Wise & Upson), 36 Pearl St., Hartford, Conn.....		May 31, 1916
VOGEL, ANDREW. Prin. Asst., R. D. Bradbury, 68 Devon- shire St., Boston, Mass.....		May 31, 1916
WADSWORTH, LEWIS LUMBER. Pres. and Cons. Engr. Hans- com Constr. Co., 70 Kilby St., Boston, Mass.....		June 3, 1915
WALL, EDWARD WALTER. Gen. Supt., The Atlas } Jun. Dec. 6, 1910 Constr. Co., 37 Belmont St., Montreal, } Assoc. M. Mar. 14, 1916 Que., Canada.....		
WAUGH, ERNEST JUDSON. Engr., Hydro-Elec. Co., Pacific Power Co., Pacific Power Corporation, and Hill- side Water Co., Benton, Cal.....		May 31, 1916
WERTHEIMER, MAX. Asst. to Bridge Engr., Cuyahoga County, 7216 Lorain Ave., Cleveland, Ohio.....		May 31, 1916

## ASSOCIATE MEMBERS (Continued)

		Date of Membership.
WHITLOW, FRANK WALLACE. Supt. of Constr., Milwaukee County Highway Dept., 518 Grove St., Milwaukee, Wis.		May 31, 1916
WILEY, RALPH BENJAMIN. Asst. Prof., Hydr. and San. Eng., Purdue Univ., 1012 Seventh St., West Lafayette, Ind.	Jun. Feb. 4, 1908.	
	Assoc. M.	May 31, 1916
WOLPERT, OTTO. Prin. Asst. Engr., Butterworth & Judson Corporation, 61 Broadway, New York City.		June 23, 1916
WONDRIES, CHARLES HENRY. Res. Engr., California Highway Comm., El Centro, Cal.		Mar. 14, 1916
WOODRUFF, GLENN BARTON. Bridge Designer, L. V. R. R., Care, Bridge Dept., L. V. R. R., South Bethlehem, Pa.	Jun. Dec. 3, 1913	
	Assoc. M.	June 23, 1916

## JUNIORS

ATKINSON, GUY. Care, The Emerson Co., 30 Church St., New York City.		June 23, 1916
BERDEAU, RAY WILLIAM. Room 103, Founders Hall, Cornell Univ., Ithaca, N. Y.		May 31, 1916
BISHOP, ROY PRENTICE. Brooklyn, Iowa.		June 23, 1916
BUTLER, ARTHUR GRAY. 160 Pennsylvania Ave., Louisville, Ky.		June 23, 1916
DAVIS, FREDERICK AUGUSTUS WILLIAM. Eng. Dept., The Amco Glazed Block Co., 347 Fifth Ave., New York City.		April 18, 1916
DE LA GUARDIA, GUILLERMO. Care, Chas. E. Griffin, 24 Stone St., New York City.		April 18, 1916
DOW, HEZEKIAH SHAILEY. 604 West 115th St., New York City.		April 18, 1916
FERGUSON, HARRY FOSTER. Prin. Asst. Engr., Illinois State Water Survey, Urbana, Ill.		June 23, 1916
FITZGERALD, WILLIAM EDWARD. 113 Radcliffe St., Bristol, Pa.		May 31, 1916
GEEACEN, JOHN LYLE. 384 Fourth St., Brooklyn, N. Y.		June 23, 1916
GROSS, FREDERICK HENRY. Eng. Dept., Bronx Parkway Comm., 17 William St., White Plains, N. Y.		May 31, 1916
HEFFELFINGER, JOHN MILTON, JR. Asst. Res. Engr., Columbus Sewage Treatment Improvement, 32 East Innis Ave., Columbus, Ohio.		June 23, 1916
HESLOP, PAUL LOVERIDGE. 401 Boyd Ave., Memphis, Tenn.		June 23, 1916
JONES, HARRY EDWARD. Transitman, M. of W. Dept., Lehigh Val. R. R., 236 Jersey St., Buffalo, N. Y.		June 23, 1916
LYTLE, HENDRIX GILBERT. Care, Div. Engr., T. & P. Ry., Marshall, Tex.		June 23, 1916
MEANS, JOHN SIMON. 1563 Downig St., Denver, Colo.		April 18, 1916

## JUNIORS. (Continued)

	Date of Membership.
NAGLER, FLOYD AUGUST. 1317 Washtenaw Ave., Ann Arbor, Mich. ....	Mar. 14, 1916
OATMAN, FRANKLYN WILLIAM. 1319 Leavenworth St., San Francisco, Cal. ....	Mar. 14, 1916
O'DONNELL, JOHN ROBERT. 394 East 16th St., Brooklyn, N. Y. ....	May 31, 1916
PUNG, WILLIAM SING-CHONG. Rodman, Oil Fields and and Santa Fe Ry., P. O. Box 248, Cushing, Okla. ....	May 31, 1916
RICHMOND, ALLEN PIERCE. Care, Central Aguirre Co., Central Aguirre, Porto Rico. ....	June 23, 1916
SLEIGHT, REUBEN BENJAMIN. Asst. Irrig. Engr., Office of Experiment Stations, U. S. Dept. of Agriculture, 301 Tramway Bldg., Denver, Colo. ....	Dec. 8, 1915
SOMMER, ISADORE MENDELSON. Designing Engr., Edward L. Soule Co., 2852 California St., Apartment 6, San Francisco, Cal. ....	May 31, 1916
STANLEY, WILLIAM EDWARD. 3210 Artlington St., Chicago, Ill. ....	May 31, 1916
STAUFFER, ISAAC YOST. Care, Standard Oil Co. of New York, Batavia, Java. ....	May 31, 1916
STRUTHERS, DAVID LINDSAY. City Engr., Wilmington, N. C. ....	Mar. 14, 1916
TEMPLIN, RICHARD LAURENCE. 3912 Campbell St., Kansas City, Mo. ....	April 18, 1916
TONG, YUNG TSO. Care, Tong Hon Sing, Chinese Post Office, Tientsin, China. ....	Mar. 14, 1916
VON DEESTEN, ARTHUR PETER. First Lieut., Corps of Engrs., U. S. A.; Engr., Field Depot, Columbus, N. Mex. ....	June 23, 1916
WAITE, CLEMENT F. Draftsman, Skamania County Highways, Underwood, Wash. ....	May 31, 1916
WEBB, CLAUDE ALLEN. 4432 Tracy St., Kansas City, Mo. ....	April 18, 1916
YOUNGLING, LOUIS SHERALD. 453 West 34th St., New York City. ....	May 31, 1916

## CHANGES OF ADDRESS

## MEMBERS

ABBOTT, FRED WALTER. 6718 Quincy St., Mt. Airy, Philadelphia, Pa.
ABBOTT, HUNLEY. Vice-Pres. and Chf. Engr., MacArthur Concrete Pile & Foundation Co., 120 Broadway, New York City.
BALDWIN, ERNEST HOWARD. Asst. Chf. of Constr., U. S. Reclamation Service, El Paso, Tex.
BAYLIS, ARTHUR RAYMOND. Asst. Engr. on Constr., I. R. T. Co. and New York Rys., 600 West 59th St., New York City.

## MEMBERS (Continued)

- BENT, CORNELIUS CONWAY FELTON. 1206 Widener Bldg., Philadelphia, Pa.  
 BILLIN, CHARLES EMERY. Southbury, Conn.  
 BLACK, RALPH PETERS. Univ. Engr., and Prof. of Eng., Univ. of the South,  
 Sewanee, Tenn.  
 BLAIR, MCCREA PARKER. 25 Westgate, Armstrong Point, Winnipeg, Man.,  
 Canada.  
 BLOOM, J. GEORGE. Supt., Amarillo Div., C., R. I. & G. Ry., Amarillo, Tex.  
 BOARDMAN, HOWARD EDWARD. Asst. Engr., Valuation Dept., N. Y. C. Lines,  
 Room 2627, Grand Central Terminal, New York City.  
 BOGGS, FRANK CRANSTOWN. Maj., Corps of Engrs., U. S. A., 21 East Elm  
 St., Norristown, Pa.  
 BOGUE, VIRGIL GAY. (*Director.*) Cons. Engr., 26 Cortlandt St., Room 1312,  
 New York City.  
 BONSTOW, THOMAS LACEY. Cia. Mexicana de Petroleo "El Aguila", S. A.,  
 Minatitlan, Ver., Mexico.  
 BRADFORD, WILLIAM. Cons. Engr., 316 South Highland Ave., Pittsburgh, Pa.  
 BREWSTER, HENRY BAUM. Engr., H. S. Kerbaugh, Inc., Box 383, Rochester,  
 N. Y.  
 BRYSON, ANDREW. New Castle, Del.  
 BURGESS, HARRY. Maj., Corps of Engrs., U. S. A., Room 337, Federal Bldg.,  
 Detroit, Mich.  
 BUTTS, EDWARD PONTANY. 60 Mulberry St., Springfield, Mass.  
 CANTINE, EDWARD IKE. Chf. Deputy State Engr., Room 303, State House,  
 Salem, Ore.  
 CARLSON, CARL ALEXIUS. Civ. Engr., U. S. N., Navy Yard, Mare Island, Cal.  
 CARPENTER, CHARLES LINCOLN. 26 Morton St., Andover, Mass.  
 CHARLES, LA VERN JOHN. 566 High St., Denver, Colo.  
 CLAPP, OTIS FRANCIS. (*Director.*) 11 Bridgham St., Providence, R. I.  
 COCHRANE, VICTOR HUGO. Engr. of Bridges, City Hall, Kansas City, Mo.  
 COE, DAVID. Hengoed, via Cardiff, England.  
 COLLIER, BRYAN CHEVES. Constr. Engr., Traylor Eng. & Mfg. Co. (Res.,  
 125 North 17th St.), Allentown, Pa.  
 COLPITTS, WALTER WILLIAM. (Coverdale & Colpitts), 66 Broadway, New  
 York City.  
 CONNOB, WILLIAM DURWARD. Maj., Corps of Engrs., U. S. A.; Asst. Chf.  
 of Staff, Southern Dept., San Antonio, Tex.  
 CONOVER, CHARLES E. Designing Engr., Public Service Comm., 120 Broad-  
 way, New York City.  
 COOMBS, STEPHEN ELBRIDGE. Special Engr., N. Y. C. R. R., Room 5041,  
 Grand Central Terminal, New York City.  
 CORNELL, GEORGE BIRDSALL. Cons. Engr., 94 Saratoga Ave., Yonkers, N. Y.  
 COURTNEY, REGINALD SYDNEY. 702 Flatiron Bldg., New York City.  
 COVERDALE, WILLIAM HUGH. (Coverdale & Colpitts), 66 Broadway, New  
 York City.  
 CREHORE, WILLIAM WILLIAMS. Cons. Engr., Beaumont, Cal.



## MEMBERS (Continued)

- CRUMP, RAPHL LEE. Merchantville, N. J.
- CURTIS, LOREN BRADLEY. Benton, Cal.
- CURTIS, WALTER WHALEY. Pres., The Rapson Coal Min. Co. and The Curtis Coal Co., 2006 North Cascade Ave., Colorado Springs, Colo.
- CUSHMAN, WILLIAM HERBERT. Chf. Engr., Hydr. Constr. Co., Flower Bldg., Watertown, N. Y.
- DARLING, FRED STEERE. 135 Friend St., Amesbury, Mass.
- DART, JUSTUS VINTON. Thompson, Conn.
- DONOVAN, CORNELIUS. Prin. Asst. Engr., U. S. Engr. Office, 1809 Napoleon Ave., New Orleans, La.
- DOSE, HENRY FREDERICK. Dist. Engr., Alaskan Eng. Comm., Anchorage, Alaska.
- ECKLES, HARRY EDWARD. 2331 West Monroe St., Chicago, Ill.
- ESTEP, JOSIAH MADISON. Cons. Engr., 601 Marshall Bldg., Cleveland, Ohio.
- FELLOWS, ABRAHAM LINCOLN. (The Field, Fellows & Hinderlider Eng. Co.), 946 Equitable Bldg., Denver, Colo.
- FELTHAM, PERCY MARSHALL. Wayercross, Ga.
- FIELD, JOHN ELLIS. (Field, Fellows & Hinderlider Eng. Co.), 946 Equitable Bldg., Denver, Colo.
- FOX, JOHN ANGELL. Secy-Mgr., Mississippi River Levee Assoc., 734 Woodward Bldg., Washington, D. C.
- FRANCIS, WALTER JOSEPH. Cons. Engr. (Walter J. Francis & Co.), 260 St. James St., Montreal, Que., Canada.
- GAYLER, ERNEST ROTTECK. Civ. Engr., U. S. N., Care, Bureau of Yards and Docks, Navy Dept., Washington, D. C.
- GILLESPIE, RICHARD HENWOOD. Chf. Engr., Sewers and Highways, Bronx, 177th St. and Third Ave. (Res., 286 East 201st St.), New York City.
- GORDON, FRED FORCE. Civ. Engr., Eastman Kodak Co., 75 South Union St., Rochester, N. Y.
- GORE, ELBERT BRUTUS. Capitol Bldg., Austin, Tex.
- GUTMAN, DAVID. Chf. Engr., John G. Brown, Witherspoon Bldg., Philadelphia, Pa.
- HAINES, HENRY STEVENS. Lenox, Mass.
- HARRIS, VAN ALEN. Pocono Lake Reserve, Pocono, Pa.
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- NOLAN, THOMAS BREW, JR. The Hawarden, Washington, D. C.
- NOREN, GEORGE ALEXANDER. Acting Engr., N. Y. C. R. R., Castleton, N. Y.
- OWEN, ARTHUR EDMUND. Chf. Engr., C. R. R. of N. J., 81 Grove St., Montclair, N. J.
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- PETERSON, OTTO WALLACE. Care, Pacific Gas & Elec. Co., Emigrant Gap, Cal.
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 nautic Station, Pensacola, Fla.  
 WEBB, ISHAM GANO. Eng. Insp. and Asst. Supt. of Constr., Board of State  
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 wood, Colo.  
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## ASSOCIATES

- BELKNAP, ROBERT ERNEST. Sales Agt., Bethlehem Steel Co., 1919 Peoples Gas Bldg., Chicago, Ill.
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- COLE, GEORGE NATHAN. 1328 Broadway, New York City.
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- MAIGNEN, JEAN PROSPER AUGUSTE. (Maignen Chemical Co.), 1311 Arch St., Philadelphia, Pa.
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## JUNIORS

- ACKHART, ANDREW LEWIS. La Salle, N. Y.
- ANDERSON, ANDREW JOHN ALBERT. 913 Irving Park Boulevard, Chicago, Ill.
- BECK, RALPH ERNEST. Junior Engr., Public Service Comm. of New York, First Dist. (Res., 14 Prospect Park, S. W.), Brooklyn, N. Y.
- BICKERTON, WILBUR EARL. Care, Trussed Concrete Steel Co., 141 Milk St., Boston, Mass.
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- HENDERSON, JOHN TAYLOR. Lieut., 2d Infantry, Nogales, Ariz.
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- KAUFMANN, ERNST GUSTAV. 735 Delaware Ave., Buffalo, N. Y.
- KRACH, FRED ROY. Insp., Inland Steel Co., 6340 Sangamon St., Chicago, Ill.
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- MORSE, FREDERICK THURLOUGH. Care, Chf. Engr. of Santa Fé Ry., Topeka, Kans.
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- OGDEN, MERTON MILES. Transitman, Div. of Surveys, Panama Canal, Balboa Heights, Canal Zone, Panama.
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- PATTERSON, CHARLES SCOTT. Div. Engr., M., K. & T. Lines, P. O. Box 21, Wichita Falls, Tex.
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- RICHARDS, WALTER ALAN. Care, Hardaway Contr. Co., Electric, N. C.
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- ROSE, ALSTON ORANGE. Asst. Engr., J. F. Witmer Co., 314 South 6th St., Ironton, Ohio.

## JUNIORS (Continued)

- SEGURA, VALERIANO. Dist. Engr., Bureau of Public Works, Manila, Philippine Islands.
- SERRA, JULIUS HERSCHEL. 1578 East 22d St., Brooklyn, N. Y.
- SMITH, HERSCHEL C. Poteau, Okla.
- SMITH, RICHARD BENNETT. Structural Draftsman, C., C., C. & St. L. Ry. Chf. Engr.'s Office, Cincinnati, Ohio.
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- STANFORD, JAMES LELAND. Hamilton, Ga.
- STOW, FREDERIC STEVENS. Roxbury, Conn.
- TAYLOR, GEORGE BLANEY. Designing Engr., Berlin Constr. Co., Berlin (Res., 96 Harrison St., New Britain), Conn.
- THORNTON, CHARLES EDWARD. Care, Virginia Lead & Zinc Corporation, Jones Store P. O., Va.
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- WARD, GEORGE SPARKMAN. Care, Beebe & Tull, Spartanburg, S. C.
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- WAY, WILLIAM FLOYD. 4730 Eleventh Ave., N. E., Seattle, Wash.
- WERNECKE, CHAUNCY. 4546 Eighteenth Ave., N. E., Seattle, Wash.
- WHITE, ROY ALBERT. R. F. D. No. 7, Coldwater, Mich.
- WILLCOX, HENRY. Asst. Supt., Kalmus, Comstock & Westcott, 9 Harcourt St., Boston, Mass.

## RESIGNATIONS

## ASSOCIATE MEMBERS

- |                                 | Date of<br>Resignation. |
|---------------------------------|-------------------------|
| CAMERON, KENNETH MACKENZIE..... | June 30, 1916           |

## JUNIORS

- |                                    |              |
|------------------------------------|--------------|
| AFFLECK, MYRON HOPKINS STRONG..... | May 19, 1916 |
|------------------------------------|--------------|

## DEATHS

- ARGOLLO, MIGUEL DE TIEVE E. Elected Member October 2d, 1895; died May 14th, 1916.
- CARTLIDGE, CHARLES HOPKINS. Elected Member, May 4th, 1904; died June 14th, 1916.



- COFFIN, AMORY. Elected Member March 3d, 1875; died June 5th, 1916.
- CONKLING, CLOUD CLIFFORD. Elected Member, January 4th, 1905; died May 8th, 1916.
- CONLON, FRANK JOSEPH. Elected Associate Member, March 2d, 1915; died June 28th, 1916.
- CORTHELL, ELMER LAWRENCE. (*President.*) Elected Member, September 2d, 1874; died May 16th, 1916.
- CUNNINGHAM, DAVID WEST. Elected Member, May 7th, 1873; died May 10th, 1916.
- FLOY, HENRY. Elected Member, June 6th, 1911; died May 5th, 1916.
- HALL, HENRY ARTHUR. Elected Member May 7th, 1902; date of death unknown.
- HILL, JAMES JEROME. Elected Fellow, January 10th, 1889; died May 29th, 1916.
- KUNZ, FREDERIC CHARLES. Elected Associate Member, February 6th, 1895; Member, December 7th, 1898; died May 3d, 1916.
- MCKENZIE, THEODORE HALL. Elected Member, September 7th, 1881; died May, 1916.
- McMULLEN, STANLEY HASTINGS. Elected Associate Member, November 3d, 1915; died July 12th, 1916.
- MAIS, HENRY COATHUPE. Elected Member, June 6th, 1883; died February 25th, 1916.
- OSGOOD, JOSEPH OTIS. Elected Junior, May 3d, 1876; Member, March 5th, 1879; died June 28th, 1916.
- ROCKWELL, JAMES VINCENT. Elected Junior, April 3d, 1900; Associate Member, February 4th, 1903; Member, November 5th, 1907; died May 24th, 1916.
- ROHWER, HENRY. Elected Member, April 1st, 1903; died May 4th, 1916.
- SCHLAFLY, ROY KARL. Elected Associate Member, September 3d, 1913; date of death unknown.
- SOOYSMITH, CHARLES. Elected Member, May 5th, 1886; died June 1st, 1916.
- WHITTEMORE, DON JUAN. (*Past-President.*) Elected Member, July 10th, 1872; Honorary Member, January 6th, 1911; died July 16th, 1916.

#### MEMBERSHIP

Total Membership of the Society, August 3d, 1916,

8 033.

## MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST

(May 2d, to July 22d, 1916)

NOTE.—This list is published for the purpose of placing before the members of this Society, the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.

## LIST OF PUBLICATIONS

In the subjoined list of articles, references are given by the number prefixed to each journal in this list:

- |  |   |
|--|---|
| (2) <i>Proceedings, Engrs. Club of Phila.</i> , Philadelphia, Pa.                    | (30) <i>Annales des Travaux Publics de Belgique</i> , Brussels, Belgium, 4 fr.                          |
| (3) <i>Journal, Franklin Inst.</i> , Philadelphia, Pa., 50c.                         | (31) <i>Annales de l'Assoc. des Ing. Sortis des Ecoles Spéciales de Gand</i> , Brussels, Belgium, 4 fr. |
| (4) <i>Journal, Western Soc. of Engrs.</i> , Chicago, Ill., 50c.                     | (32) <i>Mémoires et Comptes Rendu des Travaux, Soc. Ing. Civ. de France</i> , Paris, France.            |
| (5) <i>Transactions, Can. Soc. C. E.</i> , Montreal, Que., Canada.                   | (33) <i>Le Génie Civil</i> , Paris, France, 1 fr.   |
| (6) <i>School of Mines Quarterly</i> , Columbia Univ., New York City, 50c.           | (34) <i>Portefeuille Economiques des Machines</i> , Paris, France.                                      |
| (7) <i>Gesundheits Ingenieur</i> , München, Germany.                                 | (35) <i>Nouvelles Annales de la Construction</i> , Paris, France.                                       |
| (8) <i>Stevens Institute Indicator</i> , Hoboken, N. J., 50c.                        | (36) <i>Cornell Civil Engineer</i> , Ithaca, N. Y.  |
| (9) <i>Engineering Magazine</i> , New York City, 25c.                                | (37) <i>Revue de Mécanique</i> , Paris, France.   |
| (11) <i>Engineering (London)</i> , W. H. Wiley, 432 Fourth Ave., New York City, 25c. | (38) <i>Revue Générale des Chemins de Fer et des Tramways</i> , Paris, France.                          |
| (12) <i>The Engineer (London)</i> , International News Co., New York City, 35c.      | (39) <i>Technisches Gemeindeblatt</i> , Berlin, Germany, 0. 70m.  |
| (13) <i>Engineering News</i> , New York City, 15c.                                   | (40) <i>Zentralblatt der Bauverwaltung</i> , Berlin, Germany, 60 pfg.                                   |
| (14) <i>Engineering Record</i> , New York City, 10c.                                 | (41) <i>Electrotechnische Zeitschrift</i> , Berlin, Germany.  |
| (15) <i>Railway Age Gazette</i> , New York City, 15c.                                | (42) <i>Proceedings, Am. Inst. Elec. Engrs.</i> , New York City, \$1.                                   |
| (16) <i>Engineering and Mining Journal</i> , New York City, 15c.                     | (43) <i>Annales des Ponts et Chaussées</i> , Paris, France.   |
| (17) <i>Electric Railway Journal</i> , New York City, 10c.                           | (44) <i>Journal, Military Service Institution, Governors Island</i> , New York Harbor, 50c.             |
| (18) <i>Railway Review</i> , Chicago, Ill., 15c.                                     | (45) <i>Coal Age</i> , New York City, 10c.  |
| (19) <i>Scientific American Supplement</i> , New York City, 10c.                     | (46) <i>Scientific American</i> , New York City, 15c.   |
| (20) <i>Iron Age</i> , New York City, 20c.   | (47) <i>Mechanical Engineer</i> , Manchester, England, 3d.  |
| (21) <i>Railway Engineer</i> , London, England, 1s. 2d.                              | (48) <i>Zeitschrift, Verein Deutscher Ingenieure</i> , Berlin, Germany, 1, 60m.                         |
| (22) <i>Iron and Coal Trades Review</i> , London, England, 6d.                       | (49) <i>Zeitschrift für Bauwesen</i> , Berlin, Germany.   |
| (23) <i>Railway Gazette</i> , London, England, 6d.                                   | (50) <i>Stahl und Eisen</i> , Düsseldorf, Germany.  |
| (24) <i>American Gas Light Journal</i> , New York City, 10c.                         | (51) <i>Deutsche Bauzeitung</i> , Berlin, Germany.  |
| (25) <i>Railway Mechanical Engineer</i> , New York City, 20c.                        | (52) <i>Rigische Industrie-Zeitung</i> , Riga, Russia, 25 kop.  |
| (26) <i>Electrical Review</i> , London, England, 4d.                                 | (53) <i>Zeitschrift, Oesterreichischer Ingenieur und Architekten Verein</i> , Vienna, Austria, 70h.     |
| (27) <i>Electrical World</i> , New York City, 10c.                                   | (54) <i>Transactions, Am. Soc. C. E.</i> , New York City, \$12.   |
| (28) <i>Journal, New England Water-Works Assoc.</i> , Boston, Mass., \$1.            | (55) <i>Transactions, Am. Soc. M. E.</i> , New York City, \$10.   |
| (29) <i>Journal, Royal Society of Arts</i> , London, England, 6d.                    |   |

- (56) *Transactions, Am. Inst. Min. Engrs.*, New York City, \$6.  
 (57) *Colliery Guardian*, London, England, 5d.  
 (58) *Proceedings, Engrs. Soc. W. Pa.*, 2511 Oliver Bldg., Pittsburgh, Pa., 50c.  
 (59) *Proceedings, American Water-Works Assoc.*, Troy, N. Y.  
 (60) *Municipal Engineering*, Indianapolis, Ind., 25c.  
 (61) *Proceedings, Western Railway Club*, 225 Dearborn St., Chicago, Ill., 25c.  
 (62) *Steel and Iron*, Thaw Bldg., Pittsburgh, Pa., 10c.  
 (63) *Minutes of Proceedings, Inst. C. E.*, London, England.  
 (64) *Power*, New York City, 5c.  
 (65) *Official Proceedings, New York Railroad Club*, Brooklyn, N. Y., 15c.  
 (66) *Journal of Gas Lighting*, London, England, 6d.  
 (67) *Cement and Engineering News*, Chicago, Ill., 25c.  
 (68) *Mining Journal*, London, England, 6d.  
 (69) *Der Eisenbau*, Leipzig, Germany.  
 (71) *Journal, Iron and Steel Inst.*, London, England, 6d.  
 (71a) *Carnegie Scholarship Memoirs, Iron and Steel Inst.*, London, England.  
 (72) *American Machinist*, New York City, 15c.  
 (73) *Electrician*, London, England, 18c.  
 (74) *Transactions, Inst. of Min. and Metal*, London, England.  
 (75) *Proceedings, Inst. of Mech. Engrs.*, London, England.  
 (76) *Brick*, Chicago, Ill., 20c.  
 (77) *Journal, Inst. Elec. Engrs.*, London, England, 5s.  
 (78) *Beton und Eisen*, Vienna, Austria, 1, 50m.  
 (79) *Forschungsarbeiten*, Vienna, Austria.  
 (80) *Industrie Zeitung*, Berlin, Germany.  
 (81) *Zeitschrift für Architektur und Ingenieurwesen*, Wiesbaden, Germany.  
 (82) *Mining and Engineering World*, Chicago, Ill., 10c.  
 (83) *Gas Age*, New York City, 15c.  
 (84) *Le Ciment*, Paris, France.  
 (85) *Proceedings, Am. Ry. Eng. Assoc.*, Chicago, Ill.  
 (86) *Engineering-Contracting*, Chicago, Ill., 10c.  
 (87) *Railway Maintenance Engineer*, Chicago, Ill., 10c.  
 (88) *Bulletin of the International Ry. Congress Assoc.*, Brussels, Belgium.  
 (89) *Proceedings, Am. Soc. for Testing Materials*, Philadelphia, Pa., \$5.  
 (90) *Transactions, Inst. of Naval Archts.*, London, England.  
 (91) *Transactions, Soc. Naval Archts. and Marine Engrs.*, New York City.  
 (92) *Bulletin, Soc. d'Encouragement pour l'Industrie Nationale*, Paris, France.  
 (93) *Revue de Métallurgie*, Paris, France, 4 fr. 50.  
 (95) *International Marine Engineering*, New York City, 20c.  
 (96) *Canadian Engineer*, Toronto, Ont., Canada, 10c.  
 (98) *Journal, Engrs. Soc. Pa.*, Harrisburg, Pa., 30c.  
 (99) *Proceedings, Am. Soc. of Municipal Improvements*, New York City, \$2.  
 (100) *Professional Memoirs, Corps of Engrs., U. S. A.*, Washington, D. C., 50c.  
 (101) *Metal Worker*, New York City, 10c.  
 (102) *Organ für die Fortschritte des Eisenbahnwesens*, Wiesbaden, Germany.  
 (103) *Mining Press*, San Francisco, Cal., 10c.  
 (104) *The Surveyor and Municipal and County Engineer*, London, England, 6d.  
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- The Size of Naval Guns. Are Twelve 14-inch or Eight 17-inch Guns to be Preferred? Richmond K. Turner. (46) May 20.
- How Men Work in the Depths of the Sea. Backs Relating to Diving and Diving Apparatus. (From the Marine Engineer and Naval Architect.) (19) May 27.
- Lightage. Henry L. Joyce. (65) June.
- The Brazilian Submarine Diesel Motor-Ship Centur. (11) Serial beginning June 16.
- Some Successes and Failures of Diesel Ship. T. O. Lisle. (64) June 27.
- United States Navy's Repair Ship Prometheus. Frank A. Stanley. (70) July 6.
- Oil-Engineled Quadsip-Stream Barges on the Mississippi River. U. S. A. (11) July 7.
- The Dredge: How Italy Promotes Her South American Trade. (19) July 8.
- Steel Castings as Ship Stabilizers. (20) July 12.
- Operations on the Rolling Marine Engine. E. A. Suckroth. (73) July 13.
- The Ferry Boat. (From the Service de l'ile du Cap-Breton (Canada).) B. G. L. (73) July 13.
- Le Courant de l'Avance d'Après un Projet du Colonel Perrault. (33) Apr. 20.
- La Nouvelle ligne insubmersible d'Après un Projet du Major Montclair. (33) May 6.
- La Batterie Navale du Futur. L'évolution des Machines navales et allemandes avant la Guerre. A. Pothoué. (33) June 24.

## Mechanical.

- Compressed Air for Coal-Cutters. Sam Mavor. (106) Vol. 50, Pt. 4.
- Gas-Producer as Collector for Obtaining Power and By-Products from Unusable Fuel. Manashe Hertz Mills. (106) Vol. 50, Pt. 4.

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**Mechanical—(Continued).**

- Economies in Coal Washing.\* Sherwood Hunter. (Paper read before the Manchester Geological and Min. Soc.) (106) Vol. 51, Pt. 2.
- The Cause and Effect of "Ghost Lines" in Large Steel Forgings.\* J. O. Arnold. (75) Oct.-Dec., 1915.
- The World's Supplies of Fuel and Motive Power.\* Dugald Clerk. (74) Oct.-Dec., 1915.
- The Theory of Grinding, With Reference to the Selection of Speeds in Plain and Internal Works.\* James J. Guest. (75) Oct.-Dec., 1915.
- Struts and Tie-Rods in Motion. H. Mawson. (75) Oct.-Dec., 1915.
- Utilization of Iron and Steel Works' Slags.\* E. C. Brown. (58) Jan.
- Belt Conveyors.\* A. Robertson and A. McArthur Johnston. (Paper read before the South African Institution of Engrs.) (57) Apr. 20; (16) July 1.
- Coking, the Recovery and Working-Up of By-Products.\* Christopher Barber. (Paper read before the Sheffield Univ. Gas and Coke Oven Students' Assoc.) (22) Serial beginning Apr. 21.
- Lubrication in Practice. H. W. Petty. (Paper read before the Assoc. of Engrs. in Charge.) (47) Serial beginning Apr. 21.
- The Installation and Erection of High-Speed Machinery. J. A. McLay. (Paper read before the Assoc. of Min. Elec. Engrs.) (22) Apr. 21.
- Electric Welding and Brazing Apparatus.\* (47) Apr. 28.
- Fuel for Steam Boilers. William Kent. (Abstract of paper read before the Pan-American Scientific Congress.) (47) Apr. 28.
- Steam Safety Valves.\* George H. Clark. (55) May.
- Automatic Stucco and Plastering Machine.\* Ludwig Eisenkramer. (115) May.
- How to Use Superheated Steam.\* Charles L. Hubbard. (9) May.
- Smoke and Soot.\* James Scott. (21) May.
- Features of Rolling Mill Reversing Engines.\* W. Trinks. (116) Serial beginning May.
- Labor-Saving Devices in the Machine Shop.\* Albert A. Dowd. (9) May.
- The Utilization of By-Products from the Manufacture of Coke. C. G. Atwater. (58) May.
- Economy in Use of Blast Furnace Carbon. H. P. Howland. (116) May.
- Meeting the Demands of Fire Brick Users.\* Chas. S. Kinnison. (116) May.
- Manufacture and Characteristics of Wrought Iron Pipe.\* W. A. Phillips. (83) May 1.
- Design and Operation of the Bunsen Gas Burner. G. C. Carnahan. (Paper read before the Illinois Gas Assoc.) (83) May 1.
- Status of American By-Product Coke. Thomas C. Clarke. (Paper read before the Soc. of Chemical Industry.) (20) Serial beginning May 4; (105) May 1; (24) June 12.
- Gas Company Accounts. V. V. Smith. (Paper read before the Indiana Gas Assoc.) (83) May 1; (24) May 8.
- Manufacture of Sulphuric Acid.\* Christopher Barber. (Paper read before the Sheffield Univ. Gas and Coke-Oven Students' Assoc.) (66) May 2.
- The Effect of Salts on the Drying Behavior of Some Clays.\* Homer F. Staley. (Paper read before the Am. Ceramic Soc.) (76) May 2.
- The Burning of Porcelain. George H. Brown. (Paper read before the New Jersey Clayworkers' Assoc.) (76) May 2.
- An Extended Surface Boiler.\* (64) May 2.
- Two Five Thousand Ton Coal Storage Equipments. Henry J. Edsall. (64) May 2; (45) July 1.
- Repairing Split and Corroded Pipe with an Oxy-Acetylene Welder.\* (86) May 3.
- New Bar Mill of Notable Flexibility.\* (20) May 4.
- A Plant for Conversion from Rifle to Locomotive Building.\* (72) May 4.
- Empirical Formulas for the Proportions of Lathes.\* A. Lewis Jenkins. (72) May 4.
- Machine Molding in a Jobbing Steel Foundry.\* A. J. Abell. (20) May 4.
- On Reduction Gears.\* John H. Macalpine. (11) Serial beginning May 5.
- Horizontal Boring, Drilling, and Milling Machinery.\* (11) May 5.
- Build Crushed Stone Plant for Tunnel Muck.\* (14) May 6.
- Wire Rope Lubrication. George R. Rowland. (45) May 6; (116) June.
- The Problem of Gasoline Supply.\* (46) May 6.
- Car Dumpers in Water Shipping.\* Scott W. Linn. (45) May 6.
- Hydrogen for Balloons. E. D. Arderg. (24) May 8.
- Troubles and Care of Ammonia Compressor Valves. A. G. Solomon. (64) Serial beginning May 9.
- The Sulphur Impurity of Coal Gas. Frank Clowes. (Paper read before the Soc. of Chemical Industry.) (66) May 9.
- The Effect of the War on Gas-Works' Practice. Geoffrey Weyman. (Paper read before the North of England Gas Managers' Assoc.) (66) May 9.
- Standard Fuel-Oil Engine.\* (64) May 9.
- Methods Employed in Spanning the Treacherous Brazos River with Two 10-In. Gas Mains.\* C. R. Sutton. (86) May 10.

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## Mechanical—(Continued).

- Economics in Coal Washing. Sherwood Hunter. Paper read before the Manchester Geological and Mining Soc. (100) Vol. 51, Pt. 2.
- The Cause and Effect of "Ghost Licks" in Large Steel Forgings. J. O. Arnold. (78) Oct-Dec. 1918.
- The World's Supplies of Fuel and Motive Power. Dugald Clerk. (74) Oct-Dec. 1918.
- The Theory of Grinding. With Reference to the Selection of Speeds in Plain and the Internal Works. James J. Guest. (75) Oct-Dec. 1918.
- Structures and the Role of Motion. H. Mawson. (75) Oct-Dec. 1918.
- Utilization of Iron and Steel Works. Sirs. E. C. Brown. (58) Jan.
- Heat Conveyors. A. Robertson and A. McArthur Johnston. (Paper read before the South African Institution of Engineers.) (87) Apr. 20; (10) July 1.
- Coking the Recovery and Working-Up of By-Products. Christopher Barber. (Paper read before the Sheffield Univ. Gas and Coke Oven Students' Assoc.) (22) Serial beginning Apr. 21.
- Industries in France. H. W. Perry. (Paper read before the Assoc. of Engineers in Canada.) (47) Serial beginning Apr. 21.
- The Installation and Selection of High-Speed Machinery. J. A. McKay. (Paper read before the Assoc. of Mining Engineers.) (52) Apr. 21.
- Electric Welding and Brazing Apparatus. (47) Apr. 28.
- Fuel for Steam Boilers. William Keat. (Abstract of paper read before the Far-American Scientific Congress.) (47) Apr. 28.
- Steam Boilers. George H. Clark. (58) May.
- Automatic Stoves and Heating Machines. Indus. Electrician. (115) May.
- How to Use the Superheated Steam. Charles J. Hubbard. (9) May.
- Smoke and Soot. James Scott. (21) May.
- Features of Rolling Mill Reversing Engines. W. Trinkle. (110) Serial beginning May.
- Labor-Saving Devices in the Machine Shop. Albert A. Dowd. (9) May.
- The Utilization of By-Products from the Manufacture of Coke. C. C. Atwater. (58) May.
- Economics in Use of Blast Furnace Carbon. H. P. Howland. (110) May.
- Meeting the Demands of Pure Iron. Cass R. Kinnison. (110) May.
- Manufacture and Characteristics of Wrought Iron Pipe. W. A. Phillips. (83) May 1.
- Design and Operation of the Bureau Gas Burner. G. C. Carsthan. (Paper read before the Illinois Gas Assoc.) (83) May 1.
- Status of American By-Product Coke. Thomas C. Clarke. (Paper read before the Soc. of Chemical Industry.) (10) Serial beginning May 4; (105) May 1; (14) June 12.
- Gas Company Accounts. V. V. Smith. (Paper read before the Indiana Gas Assoc.) (83) May 1; (14) May 8.
- Manufacture of Sulphuric Acid. Christopher Barber. (Paper read before the Sheffield Univ. Gas and Coke Oven Students' Assoc.) (60) May 2.
- The Effect of Sulfur on the Drying Behavior of Some Clays. Homer F. Staley. (Paper read before the Am. Ceramic Soc.) (70) May 2.
- The Turning of Pottery. George H. Brown. (Paper read before the New Jersey Clayworkers' Assoc.) (70) May 2.
- An Expanded Surface Boiler. Henry J. Edsall. (64) May 2; (45) July 1.
- Repairing Split and Corroded Pipe with an Oxy-Acetylene Welder. (80) May 3.
- New Bar Mill of Notable Flexibility. (50) May 4.
- A Plant for Conversion from Rime to Locomotive Building. (72) May 4.
- Empirical Formulas for the Proportions of Ladles. A. Lewis Jenkins. (72) May 4.
- Machine Molding in a Jobbing Steel Foundry. A. J. Abell. (50) May 4.
- On Reduction Gases. John H. Macpherson. (11) Serial beginning May 5.
- Horizontal Roller Driven and Milling Machinery. (11) May 5.
- Build Graded Stone Piers for Tunnel Muck. (14) May 6.
- Wire Rope Lubrication. George R. Rowland. (48) May 6; (110) June.
- The Problem of Gasoline Supply. (40) May 6.
- Gas Dumpers in Water Shiplifts. Scott W. Linn. (45) May 6.
- Hydraulic for Ballrooms. R. D. Arden. (24) May 8.
- Troubles and Care of Ammonia Compressor Valves. A. G. Solomon. (64) Serial beginning May 8.
- The Sulphur Impurity of Coal Gas. Frank Clower. (Paper read before the Soc. of Chemical Industry.) (60) May 9.
- The Effect of the War on Gas-Works Practice. Geoffrey Weyman. (Paper read before the North of England Gas Managers' Assoc.) (60) May 9.
- Standard Fuel Oil Engines. (64) May 9.
- Methods Employed in Spanning the Treacherous Brazos River with Two 10-in. Gas Main. C. R. Sutton. (80) May 10.

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- Steel in Wrought-Iron Pipe; a New and Quick Etching Test for Its Detection.\* (20) May 11.
- Building Single-Purpose Lathes in a Single-Purpose Shop.\* Ethan Viall. (72) May 11.
- New Expeditious Method of Baking Cores.\* (20) May 11.
- Oil Quenching Improves Solid Nickel-Steel Forgings.\* C. J. Yarnall. (13) May 11.
- The Manufacture of Large Forging Ingots.\* Robert C. Woodward. (20) May 11.
- Excavator for Wide Cuts.\* (13) May 11.
- Caterpillar Backfiller for Trench Work.\* (13) May 11.
- Gas-Heated Melting Furnaces.\* (11) May 12.
- Electrical Precipitation of Smoke and Dust.\* Halbert P. Hill. (27) May 13.
- Economic Aspects of the New Anthracite Sizes. (45) May 13.
- Super-Zeppelins.\* Ladislav d'Orcey. (46) May 13.
- Aeroplane Stability. Orville Wright. (19) May 13.
- Natural Gas in Ohio.\* J. A. Bownocker. (Paper read before the Cleveland Eng. Soc.) (83) May 15.
- Natural Gas Development in Southern California.\* J. M. Berkley. (83) May 15.
- General Plan of the Proposed National Gas Safety Code. (83) May 15.
- The Yeardon and Guiseley Gas Company's Undertaking; the Old and New Plant. J. E. Lister. (Paper read before the Yorkshire Junior Gas Assoc.) (66) May 16.
- Cleaning Condenser Tubes.\* C. F. Hirschfeld. (64) May 16.
- Analysis of Boiler Explosion at West River, N. B.\* (64) May 16.
- The Arrangement and Requirements of Elevators in Office Buildings. Cecil F. Baker. (From the *Architectural Record*.) (86) May 17.
- Manufacture of Cartridge Brass.\* C. R. Barton. (72) May 18.
- Interpretation of Coal Analysis. E. G. Bailey. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 19; (25) June.
- Proper Care of Cranes and Hoists. H. A. Shultz. (Paper read before the Industrial Welfare and Efficiency Conference.) (47) May 19.
- A Study Concerning the Best Proportion for a Stream-Line Body.\* F. W. Lancaster. (11) May 19.
- Thorium, How It Is Extracted for Making Gas Mantles. Thurston Owens. (From the *Chemical Engineer*.) (19) May 20.
- A Comparison of Modern Coal Carbonization Plants.\* Vernon Baker. (Paper read before the Indiana Gas Assoc.) (24) May 22; (83) May 1.
- Gas Lighting and Hygiene. Robert French Pierce. (24) May 22.
- Symposium on Welding as Applied to Boilers. (64) May 23.
- Oil Washing for the Absorption of Toluol and Benjol.\* Thomas Glover. (66) May 23.
- General Electric Oil Engines for United States Government.\* Alfred D. Blake. (64) May 23.
- Proportioning Cylinder Ratio in Compound Engines.\* R. L. Wales. (64) May 23.
- Coal More Economical Than Oil. James Ross. (64) May 23.
- Special Machines for Drilling and Milling Fuse Parts.\* (72) May 25.
- Application of Cranes in the Foundry.\* T. Everett Austin. (Paper read before the Newark Foundrymen's Assoc.) (20) May 25.
- An Improved Design in Coke Ovens.\* (20) May 25.
- Rational Design of Foundation Anchor Plates.\* Terrell Croft. (72) May 25.
- New Coke Ovens at Port Clarence Works.\* (22) May 26.
- Coal Distribution Record System.\* J. G. Crawford. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 26; (18) May 20.
- The Steam Boiler of 1915.\* Arthur D. Pratt. (Abstract of paper read before the Inter. Eng. Congress.) (47) Serial beginning May 26.
- Ash, Clinker and Dust Separators.\* M. Buhle. (From *Glückauf*.) (57) May 26.
- Coal Transfer and Preparation Plant of the East Broad Top R. R. & Coal Co.\* (18) May 27.
- Steam Power for Aeroplanes. James G. Dudley. (19) May 27.
- Rust Deposits in Gas Mains and Services. A. F. Kersting. (Paper read before the Southern Gas Assoc.) (24) May 29.
- Supplement to Paper on Rust Deposits. J. W. Lansley. (24) May 29.
- Mechanical Soot Blowers. P. V. Stephens. (Abstract.) (64) May 30.
- Silica and Fireclay Materials.\* John West. (Paper read before the Manchester District Institution of Gas Engrs.) (66) May 30; (22) June 16.
- Cost of Coal and Oil as Fuel. Perry Barker. (64) May 30.
- Gearless Traction Elevators.\* (64) May 30.
- Economical Load on Boilers.\* Haylett O'Neill. (64) May 30.
- Increasing Thermal Efficiency of Automobile Engines.\* C. E. Sargent. (Paper read before the Soc. of Automobile Engrs.) (64) May 30.
- Handling Coal and Ashes at Northwest Station.\* Thomas Wilson. (64) May 30.
- Cost Determinations of 22-In. Steel Pipe Manufacture. H. A. Whitney. (86) May 31.
- Report Upon Efficiency Tests of a 30 000-Kw. Cross-Compound Steam Turbine.\* H. G. Stott and W. S. Finlay, Jr. (55) June.

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- Report Upon Efficiency Tests of a 30,000-Kw. Cross-Compound Steam Turbine. H. G. Stott and W. S. Pritchard, Jr. (52) June.
- Cost Determinations of 22-in. Steel Pipe Manufacture. H. A. Williams. (46) May 30.
- Handling Coal and Ashes at Northern Station. Thomas Wilson. (44) May 30.
- Investigation of the Efficiency of Automobile Engines. G. E. Bateman. (Paper read before the Soc. of Automobile Engineers.) (64) May 30.
- Economical Land on Boilers. Haylett O'Neil. (64) May 30.
- Geothermal Reservoirs. (64) May 30.
- Cost of Coal and Oil as Fuel. Perry Barker. (64) May 30.
- District Institution of Gas Engineers. (66) May 30; (12) June 10.
- Shill and Precipitation Matchless. John Week. (Paper read before the Manchester Mechanical Soc. Boilers.) (64) May 30.
- Supplement to Paper on Heat Deposits. J. W. Lamsley. (54) May 30.
- Heat Deposits in Gas Mains and Retorts. A. F. Kestling. (Paper read before the Southern Gas Assoc.) (54) May 30.
- Steam Power for Acetylene. James G. Duffley. (19) May 27.
- Coal Transfer and Preparation Plant of the East Broad Top R. & Coal Co. Ash Classifier and Dust Separator. M. Hubie. (From Glasgow.) (57) May 26.
- Inter Eng. Congress. (47) Serial beginning May 26.
- The Steam Boiler of 1911. Arthur D. Pratt. Abstract of paper read before the Ry. Fuel Assoc. (15) May 26; (18) May 30.
- Coal Distribution Record System. J. G. Crawford. (Paper read before the Inter. New Coke Owners at Port Clarence Works.) (23) May 26.
- National Design of Foundation Anchor Plates. Tether Greif. (75) May 25.
- An Improved Design in Coke Ovens. (50) May 25.
- Newark Foundation Assoc. (50) May 25.
- Application of Cranes in the Foundry. T. Everett Austin. (Paper read before the Special Machines for Drilling and Milling Trade Fair.) (75) May 25.
- Coal More Economical Than Oil. James Ross. (64) May 25.
- Proprietary Oilfield Halls in Compound Engines. H. L. Walker. (64) May 25.
- General Electric Oil Engines for United States Government. Alfred D. Blake. May 25.
- Oil Washing for the Absorption of Toluol and Benzol. Thomas Glover. (66) May 25.
- Gas Lighting and Hygiene. Robert F. Brown. (54) May 25.
- A Comparison of Modern Coal Carbonization Plants. Vernon Baker. (Paper read before the Chemical Engineers.) (19) May 25.
- Theoretical Flow of Gas Extracted for Making Gas Manages. Thurston Owens. (From Chester.) (11) May 19.
- A Study Concerning the Heat Production for a Steam-Line Body. F. W. Lan- White and Edmund Conner. (47) May 18.
- Proper Care of Cranes and Hoists. H. A. Shultz. (Paper read before the Industrial Fuel Assoc.) (18) May 18; (25) June.
- Interpretation of Coal Analysis. E. G. Bailey. (Paper read before the Inter. Ry. Manufacture of Carriage Bodies.) (6) May 17.
- From the American Record. (26) May 17.
- The Arrangement and Positioning of Elevators in Office Buildings. Carl F. Baker. (64) May 16.
- Analysis of Boiler Explosions at West River. R. R. (64) May 16.
- Chemical Condenser Tubes. G. F. Hirschfeld. (64) May 16.
- May 16.
- L. E. Baker. (Paper read before the Yorkshire Tannery Gas Assoc.) (66) The Yeoman and Quincey Gas Company's Undertaking: The Old and New Plant. General Plan of the Proposed National Gas Safety Code. (83) May 15.
- Natural Gas Development in Southern California. J. M. Berkeley. (83) May 15.
- Natural Gas in Ohio. J. A. Bowditch. (Paper read before the Cleveland Eng. Soc.) (83) May 15.
- Natural Gas in Ohio. J. A. Bowditch. (Paper read before the Cleveland Eng. Soc.) (83) May 15.
- Super-Heating. Laidlaw's. (44) May 15.
- Economic Aspects of the New American Steam. (45) May 15.
- Electrical Precipitation of Smoke and Dust. Halbert P. Hill. (27) May 15.
- Gas-Heated Melting Furnaces. (11) May 15.
- Catalytic Backflow for Trench Work. (13) May 15.
- Excavator for Wide Cuts. (13) May 15.
- The Manufacture of Large Forging Ingots. Robert C. Woodward. (20) May 15.
- New Expedition Method of Making Cores. (30) May 15.
- Building Single-Purpose Lathes in a Single-Purpose Shop. Elisha Viall. (75) May 15.
- Steel in Wrought-Iron Pipes: a New and Quick Dishing Test for Its Detection. (Continued.)

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**Mechanical—(Continued).**

- Advancement in Underground Ore Lading.\* M. E. Richards. (116) June.  
 Refining Vegetable and Animal Oils. Charles Baskerville. (3) June.  
 A Steam Flow Meter.\* (25) June.  
 A Modern Hydrated Lime Plant.\* Richard K. Meade. (67) June.  
 Steel Production at New Minnesota Plant.\* Charles C. Lynde. (116) June.  
 The Economics of Material Handling in Manufacturing Plants.\* Reginald Traut-schold. (9) Serial beginning June.  
 By-Products Recovery in Coke Production. W. H. Childs. (Paper read before the Am. Iron and Steel Inst.) (116) June.  
 Two Welded Gas Mains Laid under Brazos River.\* (13) June 1.  
 Automatic Manufacturing Miller with Receding Table.\* (72) June 1.  
 A Combination Boiler Meter.\* (105) June 1.  
 Originality in a Hartford Machine Works.\* (20) June 1.  
 Gasoline from Natural Gas by Absorption Methods. G. A. Burrell, P. M. Biddison and G. G. Oberfell. (Paper read before the Natural Gas Assoc.) (83) June 1; (105) June 1.  
 Drop Forging the Russian Cruciform Bayonet.\* John H. Van Deventer. (72) June 1.  
 North Carolina has 3800- and 4200-Ft. Cableways.\* (13) June 1.  
 Electric Welding in Boiler Repairs. Frank McManamy. (Paper read before the Boiler Makers' Assoc.) (15) June 2.  
 The Casting of Non-Ferrous Metals in Chill Moulds.\* F. Johnson. (Abstract of paper read before the British Foundrymen's Assoc.) (47) June 2.  
 Coal and Shipping.\* F. J. Warden-Stevens. (57) Serial beginning June 2.  
 Plain Facts About Kerosene Carburetors.\* Victor W. Page. (46) June 3.  
 Operating Cost Records Show Comparative Economy of 65 Motor Vehicles in Los Angeles Water Department.\* Burt A. Heinly. (14) June 3.  
 Pumping Costs with Diesel Engines Given in Detail.\* H. W. Gochnauer. (14) June 3.  
 Handling Retail Coal in a Concrete Cylinder Plant.\* Charles H. Higgins. (45) June 3.  
 Utilization of Gas Oil.\* R. C. Downing. (Paper read before the Illinois Gas Assoc.) (24) Serial beginning June 5.  
 Performance of Uniflow Engine and Turbine Compared.\* L. A. Quayle. (64) June 6.  
 The Exhaust Steam Turbine.\* J. Breslav. (64) June 6.  
 Foreign Gases in Refrigeration. H. J. Macintire. (64) June 6.  
 The Bailey Boiler Meter.\* (64) June 6.  
 The Application of Coal Gas to the Purpose of Illumination. William Thomas Brande. (From the *European Magazine*, May, 1816). (66) June 6.  
 How Do You Buy Coal? Carleton H. Hubbard. (Paper read before the New Jersey Clay Workers' Assoc.) (76) June 6.  
 Some Notes on Fuel Economy. John W. Lee. (Paper read before the Yorkshire Junior Gas Assoc.) (66) June 6; (22) June 23.  
 Impure Boiler Waters. William N. Berkeley. (64) June 6.  
 Lubricating Oils and Cutting Compounds for Shop Use. W. Rockwood Conover. (72) June 8.  
 Manufacture of Motor Truck Worm Drives.\* F. L. Prentiss. (20) June 8.  
 Measuring Locomotive Coal.\* (13) June 8.  
 A Steel Freight Container.\* (15) June 9.  
 The Automobile and the City Plan. Nelson P. Lewis. (Abstract of paper read before the National Conference on City Planning.) (14) June 10.  
 The Manufacture and Use of High Speed Steel. Henry D. Hibbard. (Abstract from *Bulletin of the U. S. Bureau of Mines*.) (18) June 10; (47) July 7.  
 Testing Safety Valves at the Naval Engineering Experiment Station.\* J. L. Kauffman. (64) June 13.  
 Diagram for Computing Flow of Steam in Pipes.\* Howard Harding. (64) June 13.  
 Bayer Soot-Blower System.\* (64) June 13.  
 Calculating the Quantity of Ammonia Needed (in Refrigeration). Charles H. Bromley. (64) June 13.  
 Report of the Refractory Materials Research Committee of the Institution of Gas Engineers. (66) June 13.  
 Practical Tests of Steam-Flow and Water Meters. E. G. Bailey. (Paper read before the National District Heating Assoc.) (64) June 13.  
 Report of Life of Gas-Meters Research Committee of the Institution of Gas Engineers. (66) June 13.  
 The Action of Air in Surface Condensers.\* Paul A. Bancel. (64) June 13.  
 Report of Station Operating Committee of the National District Heating Association on Boiler Operation.\* (64) June 13.  
 The Plant Crew Reduces Ash-Handling Costs.\* A. A. Norrman. (64) June 13.  
 Tractor with Ball Bearings in Endless Tread.\* (13) June 15.  
 Making Piston Rings with Grinders for the Major Operations.\* Ethan Viall. (72) June 15.  
 Welding of Joints in Gas Main Construction. F. L. Hadley. (Paper read before the Natural Gas Assoc.) (83) June 15.

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- Advancement in Underwood Ore Loading. M. E. Heberlein. (110) June.
- Refining Vegetable and Animal Oils. Charles Baskerville. (3) June.
- A Steam Flow Meter. (22) June.
- A Modern Hydraulic Lime Plant. Richard K. Meade. (67) June.
- Steel Production at New Minnesota Plant. Charles G. Lynde. (116) June.
- The Economics of Material Handling in Manufacturing Plants. Reginald Trumbull. (9) Serial beginning June.
- By-Products Recovery in Coke Production. W. H. Childs. (Paper read before the Am. Iron and Steel Inst.) (116) June.
- Two Welded Gas Mains Laid under Brazos River. (13) June 1.
- Automatic Manufacturing Millers with Receding Table. (72) June 1.
- A Combustion Boiler Water. (105) June 1.
- Outgassing in a Hartford Machine Works. (20) June 1.
- Gasoline from Natural Gas by Absorption Method. D. A. Burrell, F. M. Hiddleston and G. Oberfell. (Paper read before the Natural Gas Assoc.) (85) June 1.
- Drop Forcing the Russian Gravelman Railway. John H. Van Devanter. (72) June 1.
- North Carolina has 2,800 and 4,200-Ft. Capeswater. (43) June 1.
- Electric Welding in Boiler Repair. Frank McManis. (Paper read before the Boiler Makers Assoc.) (112) June 2.
- The Casting of Non-Ferrous Metals in Cold Chills. F. Johnson. (Abstract of) (47) June 2.
- Gas and Siphoning. F. J. Winters. (37) Serial beginning June 2.
- Coal and Siphoning. F. J. Winters. (40) June 2.
- Plain Racks About Automobiles. Victor W. Page. (40) June 2.
- Operating Coal Records Show Economy of 25 Motor Vehicles in Los Angeles Water Department. Burr A. Hainy. (14) June 2.
- Pumping Coal with Diesel Engines Given in Detail. H. W. Goehner. (14) June 2.
- Handling Coal in a Concrete Cylinder Plant. Charles H. Higgins. (43) June 2.
- Utilization of Gas Oil. R. G. Downing. (Paper read before the Illinois Gas Assoc.) (24) Serial beginning June 2.
- Performance of Turbo Engine and Turbine Compressor. L. A. Quayle. (64) June 2.
- The Exhaust Steam Turbine. J. Bradley. (64) June 2.
- Foreign Cases in Refrigeration. H. J. MacIntosh. (64) June 2.
- The Boiler Water Meter. (64) June 2.
- The Application of Coal Gas to the Purposes of Illumination. William Thomas Hargrave. (From the Engineering Magazine, May, 1916.) (60) June 2.
- How Do You Buy Coal? Carlton H. Hubbard. (Paper read before the New Jersey Clay Workers' Assoc.) (70) June 2.
- Some Notes on Fuel Economy. John W. Lee. (Paper read before the Yorkshire Fuelers Gas Assoc.) (60) June 2.
- Impure Boiler Water. William N. Hartley. (64) June 2.
- Impacting Oils and Cutting Compounds for Shop Use. W. Rockwood Conover. (71) June 2.
- Manufacture of Motor Truck Worm Drives. F. L. Prentiss. (20) June 2.
- Measuring Locomotive Coal. (13) June 2.
- A New Freight Container. (13) June 2.
- The Automobile and the City Plan. Nelson P. Lewis. (Abstract of paper read before the National Conference on City Planning.) (14) June 10.
- The National Conference on City Planning. Henry D. Hubbard. (Abstract from publication of the U. S. Bureau of Mines.) (18) June 10; (47) July 7.
- Testing Safety Valves at the Naval Engineering Experiment Station. J. L. Knappman. (64) June 12.
- Diagram for Computing Flow of Steam in Pipes. Howard Harding. (64) June 12.
- Boiler Blow-Down System. (64) June 12.
- Calculating the Quantity of Ammonia Needed in Refrigeration. Charles H. Hrom-Report of the Refrigeration Materials Research Committee of the Institution of Gas Engineers. (64) June 12.
- Practical Tests of Steam Flow and Water Meters. E. G. Bailey. (Paper read before the National District Heating Assoc.) (64) June 12.
- Report of the Gas Meters Research Committee of the Institution of Gas Engineers. (64) June 12.
- The Action of Air in Surface Condensers. Paul A. Hancock. (64) June 12.
- Report of Station Operating Committee of the National District Heating Association on Boiler Operation. (64) June 12.
- The Plant Grow Reduces Ash-Handling Costs. A. A. Norman. (64) June 12.
- Tractor with Ball Bearings in Roadless Trials. (13) June 12.
- Making Pumps with Grinders for the Motor Operation. Edgar Vail. (72) June 12.
- Welding of Joints in Gas Main Construction. F. L. Hahley. (Paper read before the Natural Gas Assoc.) (83) June 12.

**Mechanical—(Continued.)**

- Electric Telfer Lines in Smaller Gas Works.\* (Tr. from *Journal für Gasbeleuchtung*.) (83) June 15.
- The Factory Transportation of Product and Materials. W. Rockwood Conover. (72) June 15.
- Drop Forging Discussed at Philadelphia. Am. Drop Forging Assoc. (20) June 15.
- Traveling Tower Cantilever Crane for Yard Service.\* (13) June 15.
- Determining the Capacity of Compressors.\* Paul Diserens. (20) June 15.
- Coke as a Reducing Agent in the Electric Smelting Furnace. R. C. Gosrow. (105) June 15.
- Manganese Steel Welding.\* P. A. E. Armstrong. (17) June 17.
- Regulation of Weight, Size and Speed of Vehicles has Become an All-Important Problem.\* H. C. Hutchins. (14) June 17.
- Testing and Filtering of Transformer Oil. E. P. Peck. (27) June 17.
- Substitutes for Coal in the Andes.\* Benjamin L. Miller and Joseph T. Singewald, Jr. (45) June 17.
- Operating Costs for Several Diesel Engine Installations.\* (27) June 17.
- Mastery of the Air vs. Control of the Sea.\* Ladislav d'Orcey. (46) June 17.
- Purchasing Coal by Test. W. D. Stuckenberg. (Abstract of paper read before the Missouri Public Utilities Assoc.) (64) June 20.
- Margin of Power in Internal Combustion Engines. R. E. Mathot. (64) June 20.
- Burning No. 3 Buckwheat Coal on a Coxo Stoker. B. B. Hood. (64) June 20.
- Horizontal and Vertical Baffling.\* S. H. Viall. (64) June 20.
- Coal Tar and Ammonia.\* Thomas Gray. (Paper read before the Waverley Assoc. of Gas Managers.) (66) June 20.
- A Notable Machine Shop of Moderate Size.\* W. E. Freeland. (20) June 22.
- Building Interchangeable-Part Lathes.\* O. J. Abell. (20) June 22.
- Large Wheel-Type Excavator.\* (13) June 22.
- Hobbing High Prime-Number Spurgears Without Special Mechanism.\* Will O. Wynne. (11) June 23.
- New Coking and By-Product Plant at Thrishington Colliery, Durham.\* (22) June 23.
- The Bettington Boiler.\* (From *Journal of the South African Institution of Engrs.*) (57) June 23.
- Boiler Explosion at Spalding. (11) June 23.
- Boiler House Design and Operation. W. W. Lackie. (Paper read before the Incorporated Municipal Elec. Assoc.) (73) June 23; (26) June 30.
- The Wire Rope and the Coal Mine.\* James Steelman. (45) June 24.
- The Effect of Dissolved Salts in Feed Water. John B. C. Kershaw. (64) June 27.
- Engine-Room Lubrication. George A. Townsend. (64) June 27.
- The Carbonization of Pitch. E. W. Smith. (Paper read before the Midland Junior Gas Assoc.) (66) June 27.
- Operating the Carbon-Dioxide Refrigerating Machine.\* F. T. Flenniken. (64) June 27.
- Refrigeration Plant Regulations, New York and Detroit.\* (64) June 27.
- Roll Pressures in Cold-Rolling Steel.\* William K. Shepard and George C. Gerner. (72) June 29.
- Steel Scrap in Various Foundry Mixtures.\* G. S. Evans. (20) June 29.
- Cable Tramways Used on Construction Work.\* (13) June 29.
- Malleable Iron, Its Characteristics, Uses and Abuses. Enrique Touceda. (Abstract of paper read before the Pittsburgh Ry. Club.) (47) June 30.
- Internal-Combustion-Driven Electrical Sets. W. A. Tookey. (Paper read before the Assoc. of Supervising Electricians.) (47) June 30.
- The Production and Use of Power and Its Relation to Fuel Economy. G. Stanley Cooper. (22) Serial beginning June 30.
- Some Boiler Problems and Their Solutions. B. Thompson. (Paper read before the Stoke-on-Trent Engrs. Assoc.) (47) Serial beginning June 30.
- A Novel Method of Handling Boilers to Prevent Corrosion and Scale. Allen H. Babcock. (55) July.
- Recovery of Potash at the Security Cement Plant.\* (67) July.
- Capacity and Economy of Multiple Evaporators.\* E. W. Kerr. (55) July.
- Machinery for Package Freight Handling.\* R. H. Rogers. (From *General Electric Review*.) (108) July.
- Steam Lubrication of Construction Machinery.\* S. E. Lawrence. (100) July.
- Heat Treatment for Drop Forged Steels. W. C. Peterson. (Paper read before the Drop Forge Assoc.) (62) July.
- Scale Removal from Drop Forged Parts. W. C. Lytle. (Paper read before the Am. Drop Forge Assoc.) (62) July.
- How to Use the Oxy-Acetylene Process. Henry Cave. (9) July.
- Electric Arc for Welding Tool Steel Tips.\* C. B. Auel. (62) July.
- Dynamical Stability of Aeroplanes. Jerome C. Hunsaker. (From *Proceedings of the National Academy of Sciences*.) (19) July 1.
- The Field for New Achievements in the Motor Vehicle Industry. Marins C. Krarup. (46) July 1.
- The Preparation of Bituminous Coal.\* Andrews Allen. (Paper read before the Kentucky Min. Inst.) (45) July 1.

- Mechanical—(Continued).**
- Electric Trolley Lines in Smaller Gas Works\* (Tr. from Journal for Gas-  
Electricity) (81) June 15.
- The Factory Transportation of Product and Materials W. Rockwood Conover.  
(77) June 15.
- Drop Forging Discussed at Philadelphia. Am. Drop Forging Assoc. (20) June 15.
- Traveling Tower Crane for Yard Service\* (14) June 15.
- Determining the Capacity of Compressors\* Paul Dierksen. (20) June 15.
- Coke as a Reducing Agent in the Electric Smelting Furnace. R. C. Gostow. (103)  
June 15.
- Manganese Steel Welding\* P. A. H. Armstrong. (17) June 17.
- Regulation of Weight, Size and Speed of Vehicles has become an All-important  
Problem\* H. C. Hutchinson. (14) June 17.
- Testing and Filtering of Transformer Oil. H. P. Beck. (17) June 17.
- Substitutes for Coal in the Anodes\* Benjamin L. Miller and Joseph T. Singewald.  
(42) June 17.
- Operating Costs for Several Diesel Engine Installations\* (27) June 17.
- Ministry of the Air Control of the Sea\* Ladislav D'Orsy. (46) June 17.
- Manufacture of Cast Iron by the W. B. Rockwood Corp. (Abstract of paper read before the  
American Society of Mechanical Engineers) (64) June 20.
- Material of Power in Internal Combustion Engines. R. E. Mott. (64) June 20.
- Burners No. 2 Backward Coal in a Coal Stoker. H. B. Hood. (64) June 20.
- Horizontal and Vertical Lifting\* S. H. Vail. (64) June 20.
- Coal Tar and Ammonia\* Thomas Gray. (Paper read before the Westway Assoc.  
of Gas Manufacturers) (60) June 20.
- A Portable Machine Shop on Mobile Site\* W. E. Freeland. (20) June 22.
- Building Interchangeable-Pair Lathes\* O. J. Abel. (20) June 22.
- Large Wheel-Type Excavator\* (15) June 22.
- Hopping High Prime-Mover Spindles Without Special Mechanism\* Will O.  
Wynne. (11) June 22.
- New Gearing and Hy-Product Plant at Thibaulton Colliery, Durham\*. (25)  
June 22.
- The Bellington Hoiler\*. (From Journal of the South African Institution of Engineers)  
(37) June 22.
- Hoiler Explosion at Springfield. (11) June 22.
- Hoiler House Design and Operation\* W. W. Lackie. (Paper read before the In-  
corporated Municipal Elec. Assoc.) (73) June 22.
- The Wire Rope and the Coal Mine\* James Steelman. (45) June 24.
- The Effect of Dissolved Salts in Fuel Water. John B. C. Ketchum. (64) June 27.
- Engine-Room Lubrication. George A. Townsend. (64) June 27.
- The Construction of Pumps. E. W. Smith. (Paper read before the Midland Junior  
Gas Assoc.) (60) June 27.
- Operating the Carbon-Dioxide Refrigerating Machine\* E. T. Fennelken. (64)  
June 27.
- Refrigeration Plant Regulations. New York and Detroit\*. (64) June 27.
- Roll Pressures in Cold-Rolling Steel\*. William K. Shepard and George C. Gerner.  
(71) June 27.
- Steel Setup in Various Foundry Mixtures\* G. S. Evans. (20) June 29.
- Cable Tramways Used on Construction Work\* (13) June 29.
- Malicious Iron in Constructional Uses and Analyses. Multiple Tonnages. (Abstract  
of paper read before the Pittsburgh Ry. Club.) (47) June 30.
- Internal-Combustion-Driven Electrical Sets. W. A. Tooker. (Paper read before  
the Assoc. of Superintending Electricians) (47) June 30.
- The Production and Use of Power and Its Relation to Fuel Economy. G. Stanley  
Cooper. (25) Serial beginning June 30.
- Some Hoiler Problems and Their Solutions. R. Thompson. (Paper read before the  
Society of Mechanical Engineers) (47) Serial beginning June 30.
- A Novel Method of Handling Rollers to Prevent Corrosion and Scale. Allen H. Bab-  
cock. (23) July.
- Recovery of Potash at the Security Cement Plant\* (67) July.
- Capacity and Economy of Multiple Evaporators\* E. W. Kerr. (25) July.
- Manufacture of Lathes for Freight Handling\* R. H. Rogers. (From General Elec-  
tric Review) (108) July.
- Steam Lubrication of Construction Machinery\* S. E. Lawrence. (100) July.
- Heat Treatment for Drop Forged Steels. W. C. Peterson. (Paper read before the  
Drop Works Assoc.) (62) July.
- Scale Removal from Drop Forged Parts. W. C. Lytle. (Paper read before the  
Am. Drop Forge Assoc.) (62) July.
- How to Use the Ox-Acetylene Process. Henry Gave. (9) July.
- Electric Arc for Welding Tool Steel Tips\* C. R. Auel. (62) July.
- Dynamic Stability of Airplanes. Jerome C. Hunsaker. (From Proceedings of  
the National Academy of Sciences) (119) July 1.
- The Field for New Achievements in the Motor Vehicle Industry. Martin C. Kierup.  
(46) July 1.
- The Preparation of Bituminous Coal\* Andrews Allen. (Paper read before the  
Kentucky Min. Inst.) (42) July 1.

**Mechanical—(Continued).**

- A New Portable Coke Loader.\* L. R. W. Allison. (45) July 1.  
 Belt and Bucket Elevators.\* Arthur O. Gates. (16) July 1.  
 A New Design of By-Product Gas Oven.\* William Felcks. (83) July 1.  
 Stopping the Waste of a Scove Kiln.\* (76) July 4.  
 The Path to Success in Operating a Continuous Coal-Fired Tunnel Kiln. A. F. Greaves-Walker. (76) Serial beginning July 4.  
 Thermal Problems for Gas Engines. Norton H. Humphrys. (66) Serial beginning July 4.  
 The Pyrometer a Cost-Cutting Agent. C. O. Arbogust and L. J. Sheridan. (76) Serial beginning July 4.  
 Aerial Tramway as Substitute for a Bridge.\* (13) July 6.  
 Half-Hour Performances of 4-Wheel Scrapers. (13) July 6.  
 Dispatch System of Norton Grinding Company.\* (20) July 6.  
 Influence of Viscosity in Pumping Crude Oil. Arthur L. Collins. (13) July 6.  
 Steel Storage in a Hartford Factory.\* (20) July 6.  
 Aerial Ropeway at Niagara Falls.\* (12) July 7.  
 The Production of Smokeless Fuel, Gas, Oil and Ammonia.\* (22) July 7.  
 Paraffin for Petrol Engines.\* (12) July 7.  
 Heat Transmission Through Boiler Tubes.\* (From *Technical Paper 114*, Bureau of Mines.) (12) July 7.  
 The Steam Flow Into a Compound Steam-Turbine. (11) July 7.  
 The Miracle of Motor Transport.\* Joseph Brinker. (46) July 8.  
 High Turbine Economy at Poor Load Factors.\* (27) July 8.  
 Massachusetts Gas Commission Considers Calorific Standard. (24) July 10.  
 Introduction of Electromagnetic Separators Marked Increase in Quality and Quantity of Monazite Output (for Gas Mantles).\* Reginald Gordon. (24) July 10.  
 Purchase and Inspection of Leather Belting. (72) July 13; (16) July 1.  
 Anchor-Bolt Holes Drilled by Gasoline-Air Outfit.\* H. L. Hicks. (13) July 13.  
 Chicago Station has 45 000-H.p. Steam Turbine.\* (13) July 13.  
 Building Up Industrial Fuel Business. S. Tully Willson. (Paper read before the Southern Gas Assoc.) (83) July 15.  
 General Principles of Workroom Lighting. A. L. Powell. (Paper read before the Am. School Hygiene Assoc.) (83) July 15.  
 Restoration of Gas Mains Over Rapid Transit Tunnels.\* J. E. Worsley. (83) Serial beginning July 15.  
 Description of Pintsch-Bolz Vertical Producers.\* W. Schweizer. (From *Journal für Gasbeleuchtung*.) (83) July 15.  
 The Merits of Oil and Grease Lubrication. W. J. Fouhy. (82) July 15.  
 Temporary Pipes Along Curb and on Trestles Over Street Carry Good Part of New York City's Gas Supply During Subway Construction.\* C. N. Green. (24) July 17.  
 A Method of Cutting Cams.\* F. P. Ampudia. (72) July 20.  
 Some Foundry Practice in a Connecticut Plant.\* Frank A. Stanley. (72) July 20.  
 Powdered Coal Burning.\* (20) July 20.  
 Jigs and Tools Used in Making Pipe and Other Wrenches.\* Ethan Viall. (72) July 20.  
 A Machine Shop with Notable Features.\* (20) July 20.  
 Uniflow Engine for Rod Mill.\* O. J. Abell. (20) July 20.  
 Arrangement and Maintenance of Machine Tools. W. Rockwood Conover. (72) July 20.  
 Recording the Performance of Large Boiler Units. Gilbert Rutherford. (27) July 22.  
 La Manutention Mécanique des Combustibles dans les Dépôts de la Compagnie d'Orléans.\* L. de Boysson. (33) Apr. 22.  
 Fabrique de Ciment et de Chaux Hydraulique à Casablanca (Maroc).\* Ch. Dantin. (33) Apr. 29.  
 L'Emploi du Charbon Pulvérisé pour le Chauffage des Fours Sidérurgiques.\* Ch. Dantin. (33) June 10.

**Metallurgical.**

- Addendum on Alloys of Iron and Molybdenum.\* Sir Robert A. Hadfield. (75) Oct.-Dec., 1915.  
 The Chemical and Mechanical Relations of Iron, Molybdenum, and Carbon.\* J. O. Arnold and A. A. Read. (75) Oct.-Dec., 1915.  
 The Zinc Smelter of To-day. F. E. Pierce. (58) Feb.  
 Rustless Ferro-Alloys.\* Leslie Aitchison. (12) Serial beginning Apr. 21.  
 A Pre-Heated Blast Cupola. J. A. Parsons. (Paper read before the South African Institution of Engrs.) (47) Apr. 28.  
 Cyanidation at the Comacaran Mine, Salvador.\* A. B. Peckham. (103) Apr. 29.  
 Flotation Practice in Missouri. L. A. Delano. (103) Apr. 29.  
 Working Data on Electrolytic Precipitation.\* P. H. Crawford. (103) Apr. 29.  
 Recent Progress in Flotation. Robert J. Anderson. (3) May.  
 Review of Recent Progress in Electrolytic Iron. Oliver W. Storey. (Paper read before the Am. Electrochemical Soc.) (105) May 1; (47) June 23.

\* Illustrated.



## Mechanical—(Continued).

- A New Portable Coke Lander, L. R. W. Allison, (45) July 1.  
 Bell and Buckle Elevators, Arthur O. Gates, (10) July 1.  
 A New Design of Hy-Friction Gas Over, William Beckel, (83) July 1.  
 The Waste in a Waste Kiln, (78) July 1.  
 The Fall in Success in Operation a Continuous Coal-Fired Tunnel Kiln, A. F. The Waste-Walker, (70) Serial beginning July 1.  
 Thermal Problems for Gas Engines, Norton H. Humphrey, (66) Serial beginning July 1.  
 The Pyrometer a Coal-Cutting Agent, C. O. Arpogard and L. J. Sheridan, (70) Serial beginning July 1.  
 Aerial Tramway as Substitute for a Bridge, (11) July 6.  
 Half-Hour Performance of a Wheel Stepper, (11) July 6.  
 Discharge System of Water Grinding Company, (130) July 6.  
 Influence of Viscosity in Pumping Crude Oil, Arthur L. Collins, (13) July 6.  
 Steel Structure in a Hardrock Tunnel, (30) July 6.  
 Aerial Highway as Niagara Falls, (12) July 7.  
 The Production of Smokeless Fuel Gas Oil and Ammonia, (12) July 7.  
 Parallel for Tunnel Boring, (12) July 7.  
 Heat Transmission Through Boiler Tubes, (12) July 7.  
 The Steam Flow into a Compound Steam-Turbine, (11) July 7.  
 The Mirrors of Motor Transport, Joseph Richter, (40) July 8.  
 High Turbine Economy at Four Load Factors, (12) July 8.  
 Massachusetts Gas Commission Considers Certain Standards, (14) July 10.  
 Introduction of Electrochemical Separators Marked Increase in Quality and Quantity of Metallic Output for Gas Mantles, (14) July 10.  
 Interests and Inspection of Industrial Heating, (12) July 10.  
 Another Hot House Built by Gasoline-Air Engine, H. L. Hines, (13) July 10.  
 Chicago Station has 15,000-Hp Steam Turbine, (12) July 10.  
 Building Up Industrial Fuel Business, S. Tully Wilson, (Paper read before the Southern Gas Assoc.), (85) July 10.  
 General Principles of Workroom Lighting, A. L. Powell, (Paper read before the Am. School Hygiene Assoc.), (85) July 10.  
 Restoration of Gas Mines Over Rapid Tunnel Tunnels, J. E. Worley, (81) Serial beginning July 10.  
 Description of Process-Belt Vertical Processors, W. Schwabert, (From Journal for Gas Engineers), (83) July 10.  
 The Motor of Oil and Gas Lamination, W. J. Parnell, (83) July 10.  
 Temporary Pipe Along Cais and on Trestles Over Street Car's Good Part of New York City's Gas Supply During Subway Construction, C. N. Green, (14) July 11.  
 A Method of Cutting Gases, E. P. Ambush, (75) July 20.  
 Some Recently Proposed in a Connection Plant, Frank A. Stanley, (75) July 20.  
 Powdered Coal Burning, (70) July 20.  
 Lign and Tools Used in Making Pipe and Other Wrenches, Edwin Vail, (73) July 20.  
 A Machine Shop with Notable Features, (70) July 20.  
 Outfitting Engine for Red Mill, G. J. Apple, (50) July 20.  
 Arrangement and Maintenance of Machine Tools, W. Hookwood Conover, (73) July 20.  
 Recording the Performance of Large Boiler Units, Gilbert Rutherford, (57) July 20.  
 La Manufacture Mécanique des Composites dans les Dégâts de la Compagnie "Horsens", L. de Housens, (33) Apr. 22.  
 Fabrication du Gisement et de la Chaux Hydratée à Casablanca (Maroc), Ch. Dautin, (33) Apr. 22.  
 L'Emploi du Gisement Privé pour le Chauffage des Fours Réfractaires, Ch. Dautin, (33) June 10.
- Metallurgical.**  
 Addendum on Alloys of Iron and Molybdenum, Sir Robert A. Hadfield, (75) Oct-Dec. 1915.  
 The Chemical and Mechanical Relations of Iron, Molybdenum, and Carbon, J. O. Arnold and A. A. Reed, (75) Oct-Dec. 1915.  
 The Zinc Smelter of To-day, F. E. Porter, (28) Feb.  
 Russian Ferro-Alloys, Leslie Atchison, (11) Serial beginning Apr. 21.  
 A Pre-Heated Blast Furnace, J. A. Parsons, (Paper read before the South African Institution of Engineers), (47) Apr. 28.  
 Cyanidation at the Comanchero Mine, Salvador, A. H. Peckham, (103) Apr. 29.  
 Flotation Practice in Missouri, L. A. Delano, (103) Apr. 29.  
 Working Data on Electrolytic Flotation, F. H. Crawford, (103) Apr. 29.  
 Recent Progress in Flotation, Robert J. Anderson, (7) May.  
 Review of Recent Progress in Electrolytic Iron, Oliver W. Henry, (Paper read before the Am. Electrochemical Soc.), (103) May 1; (47) June 23.

**Metallurgical—(Continued).**

- Cost Accounting in the Construction and Operation of a Copper Smelter. Ernest Edgar Thum. (105) Serial beginning May 1.
- Electric Furnace Products. F. J. Tone. (Paper read before the Am. Electrochemical Soc.) (105) May 1.
- The Calculation of the Burden of the Blast Furnace. J. E. Johnson, Jr. (105) May 1.
- Simple Tungsten Steel. Henry D. Hubbard. (*Bulletin*, U. S. Bureau of Mines.) (47) May 5.
- Ferro-Concrete Bunkers at the Brymbo Works, Wrexham.\* F. C. Coleman. (57) May 5.
- The Double Roasting Process at East Helena. X. (103) May 6.
- Chloridizing and Leaching Plant of Virginia Smelting Co.\* F. A. Eustis. (16) May 6.
- Quicksilver Reduction. Herbert Lang. (103) May 13.
- Fine Grinding: Stamps and Ball-Mills. Henry Hanson. (103) May 13.
- How Flotation Works.\* G. D. Van Arsdale. (16) May 13.
- Soap as a Frothing Agent in Flotation. M. H. Thronberry. (103) May 13.
- Some Faults of the Small Electric Arc Furnace for Melting and Refining Steel. W. M. McKnight. (Paper read before the Am. Electrochemical Soc.) (111) May 13; (82) May 20.
- Electrolysis of Alkaline Solutions of Potassium Sulphocyanate. Walton J. Crook, L. E. Booth and Arthur Thiel. (105) May 15.
- Flotation and Cyanidation. (105) May 15.
- Blast Furnace Operation. J. E. Johnson, Jr. (105) May 15.
- Bethlehem's New Electric Steel Plant.\* (20) May 18.
- Direct Drive for Flotation Machines.\* Girard B. Rosenblatt. (82) May 20.
- Breaking Down Froth in Flotation Work.\* (82) May 20.
- Effect of Black Slime on Cyanidation. H. Fischer. (103) May 20.
- Mechanical Feeding as Applied to Silver-Lead Blast Furnaces.\* L. Douglass Anderson. (16) May 20.
- The New Bag-House at the Midvale Smelters.\* L. S. Austin. (103) May 20.
- Viscosity of Furnace Slags.\* (20) May 25; (116) June.
- Tin Smelting at Perth Amboy, N. J.\* Richard H. Vall. (16) May 27.
- The Dry Chlorination of Complex Ores.\* S. A. Ionides. (103) May 27.
- The Roitshelm-Remy Continuous Zinc Distillation Process.\* M. Liebig. (Tr. by Oliver C. Ralston from *Metall und Erz.*) (105) June 1.
- The Distribution of Silver Between Metallic Lead and Litharge-Containing Slags. Boyd Dudley, Jr. (105) Serial beginning June 1.
- The Electric Furnace in Steel Manufacture. John A. Mathews. (Paper read before the Am. Iron and Steel Inst.) (20) June 1; (22) June 23; (47) June 23; (116) June.
- The Distribution of the Charge Column and of the Ascending Gas Columns (in a Blast Furnace). J. E. Johnson, Jr. (105) June 1.
- Distribution of Raw Materials in the Blast Furnace.\* George W. Vreeland. (Paper read before the Am. Iron and Steel Inst.) (20) June 1; (116) June.
- Controlling Piping and Segregation in Steel Ingots. Henry M. Howe. (Paper read before the Am. Iron and Steel Inst.) (47) June 2.
- Variable Factors in Malleable Iron Production.\* L. E. Gilmore. (Paper read before the Am. Foundrymen's Assoc.) (47) June 2.
- The Flotation Process at Goldfield, Nevada. A. H. Martin. (82) June 3.
- Roasting and Acid-Making at Braden, Chile.\* (Abstract from *Teniente Topics.*) (103) June 3.
- The Economical Use of Blast Furnace Gas.\* (20) June 8.
- The Roasting of Blende. Maurice de Lummen. (From the *Chemical Trade Journal.*) (16) June 10.
- The Cerro de Pasco District, Peru.\* Joseph T. Singewald, Jr. and Benjamin Le Roy Miller. (16) June 10.
- The Sherardizing Process. Oliver W. Storey. (105) June 15.
- A New Dry Amalgamator.\* Leroy A. Palmer. (105) June 15.
- Flotation Oils. O. C. Ralston. (105) June 15; (103) June 10; (82) June 10.
- Extraction of Gold and Silver from Matte by Lead. W. Mostowitsch. (Tr. from *Journal of the Russian Metallurgical Soc.*) (105) June 15.
- Flotation Versus Cyanidation. Jackson A. Pearce. (105) June 15.
- Electric Furnace Melting of Ferro-Alloys. R. S. Wille. (Abstract of paper read before the Am. Electrochemical Soc.) (73) June 16.
- Milling and Smelting at Humboldt, Arizona.\* W. A. Scott. (82) June 17.
- Flotation Process at the Standard Mill, Silverton, B. C.\* James G. Parmalee. (82) June 17.
- Brittle Annealed Copper. W. E. Ruder. (Abstract of paper read before the Am. Electrochemical Soc.) (47) June 23.
- The King Process of Refining Copper.\* (82) June 24.
- Mill Equipment of the Engels Copper Mining Co.\* W. A. Scott. (82) June 24.
- Malleable Iron, Its Characteristics, Uses and Abuses. Enrique Touceda. (Abstract of paper read before the Pittsburgh Ry. Club.) (47) June 30.

\* Illustrated.

## Metallurgical—(Continued).

- Cost Accounting in the Connection and Operation of a Copper Smelter. Ernest Edgar Thum. (195) Serial beginning May 1.
- Electric Furnace Products. E. J. Toner. (Paper read before the Am. Electrochemical Soc.) (102) May 1.
- The Calculation of the Burden of the Blast Furnace. J. E. Johnson, Jr. (108) May 1.
- Simplex Tungsten Steel. Henry D. Hubbard. (Bulletin, U. S. Bureau of Mines.) (47) May 2.
- Perry-Concrete Buckets at the Hydropower Works. Wexham\*. E. C. Coleman. (27) May 3.
- The Double Roasting Process at East Helena. K. (103) May 3.
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- How Flotation Works\*. G. D. Van Arsdale. (10) May 13.
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- Mill Equipment of the Nevada Copper Mining Co\*. W. A. Scott. (82) June 24.
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- Manufacturing British 8-In. Shells in 4½ Hours.\* Fred H. Colvin. (72) Serial beginning May 4.  
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- The Shaking and Movement of a Circular Shaft. James Nisbet. (Paper read before the Min. Inst. of Scotland.) (100) Vol. 51, Pt. 2.
- Carbon Dioxide as an Agent in Extinguishing Mine Fires with Special Reference to the Application at the Beaumont Colliery. Edgar C. Evans. (Paper read before the Manchester Geological and Min. Soc.) (100) Vol. 51, Pt. 2.
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 Speeding Up an Engineering Factory.\* R. Rankin. (Abstract of paper read before the Junior Institution of Engrs.) (47) Serial beginning Apr. 21; (73) Serial beginning Apr. 21.  
 Effect of Atmospheric Pressure on the Candle Power of Various Flames.\* E. B. Rosa, E. C. Crittenden and A. H. Taylor. (Paper read before the Illuminating Eng. Soc.) (66) Apr. 25.  
 The Forest Resources of Newfoundland. Daniel Morris. (29) Apr. 28.  
 Equitable Specifications and Contracts. Hillis F. Hackedorn. (55) May.  
 Methods of Figuring Manufacturing Costs. C. B. Auel. (From the *Electric Journal*.) (62) May.  
 Engineering Schools and Industrial Methods. H. L. Gantt. (9) May.  
 Engineering Coöperation. R. W. Parkhurst. (36) May.  
 Engineering in the Great European War. Frank W. Skinner. (36) May.  
 Our Earth a Great Magnet. L. A. Bauer. (3) May.  
 The Nitrogen Industry. W. S. Landis. (Paper read before the Am. Electro-Chemical Soc.) (105) May 1.  
 The Conifer Leaf Oil Industry.\* A. W. Schorger. (Paper read before the Am. Electro-Chemical Soc.) (105) May 1.  
 The Nitration of Toluene. E. J. Hoffman. (105) May 1.  
 Humidity and Its Measurement. Kenneth G. Smith. (From the *Iowa Engineer*.) (64) May 2.  
 Determining Benzene Toluene and Solvent Naphtha in Light Oils, Etc.\* Dyke Wilison and Ivan Roberts. (From the *Gas Record*.) (66) May 2.  
 Engineering and Scientific Research. J. A. Fleming. (Paper read before the Eng. and Scientific Research Conference and the Soc. of Engrs.) (104) May 5; (57) May 12; (47) May 5.  
 Estimating Metallic Aluminum in Aluminum Dust. J. E. Clennell. (16) May 6.  
 Does Present-Day College Education Produce Accuracy and Thoroughness; a Discussion between Professors George F. Swain and Daniel W. Mead Arising from the Former's Strictures on College Graduates. (14) May 6.  
 Financing Public Utilities Under State Control and Service Rate and Rate of Return. Chester P. Wilson. (Paper read before the Indiana Gas Assoc.) (24) May 15; (83) July 15.

## Mining—(Continued).

- Gold Mining in the Philippines. C. M. Eyer. (103) June 17.  
 Geologic Foundation for Mining Installations. Alcega del Mar. (81) June 17.  
 Laboratory Excavator in the Klondike. C. A. Thomas. (10) June 17.  
 A Novel Device for Making Deviation Tests on Surveys in Deep Drill Holes. (40) June 17.  
 Dust Alaying in Rand Mines. A. Cooper Key. (18) June 17.  
 Supplying Fresh Air Through Canyons Tubes to Underground Workers. (40) June 24.  
 Mexico's New Mining Law in Effect July 1. (85) June 24.  
 Explosives on the Farm. Thomas M. Kolsh. (108) July 1.  
 Hauling Pits Holes in Clay. J. H. Seaver. (17) July 1.  
 New Tipples at Glenora, Ohio. Miner Raymond. (43) July 1.  
 Rock Excavation in Coal Mines. C. Jackson. (43) July 1.  
 Automatic Deep-Bottom Mine Car. (43) July 1.  
 Prices of Machinery for Mines. (43) July 1.  
 On the Liberation of Gas in Mines. N. Tunnahill. (From *Corro-Schreibs*)  
 (43) July 1.  
 Mine Ventilation Stoppings. R. T. Williams. (37) July 1.  
 Flaming Process at Chapulcanmala, Chile. Howard W. Moore. (103) July 2.  
 Amalgams of Bolivian Mines. Mark R. Lamb. (10) July 2.  
 Electrical Distribution and Application in Mines. H. M. Warren. (43) July 15.  
 A History of the Homestake Mine. S. D. Richard Blackman. (81) July 15.  
 Cost of Installing Four Large Electric Mine Pumps. (43) July 15.  
 Stope Surviving at Mount Pelee. D. F. Jenkins and L. J. Conner. (Paper read before the American Inst. of Min. Engrs.) (10) July 15.  
 Experiment in Installing Steam Heaters in Quarries. Oliver Howler. (Abstract from *Bulletin* 100, Bureau of Mines.) (80) July 15.  
 Nomenclature of Mining Methods. George J. Young. (10) July 22.  
 La Remplacement Hydrographie des Mines. *Bulletin du Service de l'Enseignement des Mines de la France*. (33) June 17.

## Miscellaneous.

- The Application of Efficiency Principles. Fred H. Hinds. Jr. (103) Sept. 25.  
 Engineering Colleges and the War. H. Mullinex Watkins and C. E. Latsky. (73) Oct.-Dec. 1912.  
 Some Details Often Overlooked by Engineers. A. Stucki. (58) Feb.  
 The Relation Between Engineers and Contractors. J. W. Rollins. (53) Mar.  
 The Necessity for a National Department of Public Works. Isham Randolph. (58) Apr.  
 Labor, Wealth and Efficiency. J. W. Lachoux. (7) Apr.  
 Public Contracts. R. P. Orr. (30) Apr.  
 Speeding Up an Engineering Factory. R. Rankin. (Abstract of paper read before the Junior Institution of Engrs.) (47) Serial beginning Apr. 21. (73) Serial beginning Apr. 21.  
 Effect of Atmospheric Pressure on the Candle Power of Various Lamps. E. H. Ross. R. C. Critchfield and A. H. Taylor. (Paper read before the Illuminating Eng. Soc.) (60) Apr. 25.  
 The Forest Resources of Newfoundland. Daniel Morris. (59) Apr. 28.  
 Equitable Specifications and Contracts. Willie F. Haddock. (53) May.  
 Methods of Fixating Manufacturing Costs. C. B. Adel. (From the *Electric Journal*.) (63) May.  
 Engineering Schools and Industrial Methods. H. A. Gault. (9) May.  
 Engineering Cooperation. R. W. Parkhurst. (30) May.  
 Engineering in the Great European War. Frank W. Skinner. (30) May.  
 Our Birth a Great Man. J. A. Bauer. (3) May.  
 The Nitrogen Industry. W. E. Laidley. (Paper read before the Am. Electro-Chem. Soc.) (103) May 1.  
 The Coalier Deal Oil Industry. A. W. Schotter. (Paper read before the Am. Electro-Chem. Soc.) (103) May 1.  
 The Nitration of Toluene. E. J. Hoffman. (103) May 1.  
 Humidity and Its Measurement. Kenneth G. Smith. (From the *Iron Age*.) (64) May 2.  
 Determining Benzene Toluene and Solvent Naphtha in Light Oil. Etc. Dye Whitney and Ivan Roberts. (From the *Gas Record*.) (60) May 2.  
 Engineering and Scientific Research. J. A. Fleming. (Paper read before the Eng. and Scientific Research Conference and the Soc. of Engrs.) (104) May 3.  
 Estimating Metallic Alloys in Aluminum Duct. J. E. Clemen. (10) May 6.  
 Does Present-Day College Education Produce Accuracy and Thoroughness? A Discussion Between Professors George F. Swain and Daniel W. Reed. Arising from the former's Students on College Graduates. (14) May 6.  
 Financing Public Utilities Under State Control and Service Rate and Rate of Return. Chester F. Wilson. (Paper read before the Indiana Gas Assoc.) (14) May 15.  
 15 (83) July 15.

**Miscellaneous—(Continued).**

- The Chemical Analysis of Rubber Goods.\* Andrew H. King. (105) May 15.  
 Coating for Blue-Print Paper.\* (19) May 20.  
 The Gasoline Question.\* (103) May 20.  
 Do Engineers Need Standard Contract Forms Backed by National Societies? (14) May 27.  
 Tar Products; Their Past and Future. J. Herbert Canning. (Paper read before the Wales and Monmouthshire District Institution of Gas Engrs. and Managers.) (66) May 30.  
 How to Study Factory Efficiency.\* J. K. Mason. (9) June.  
 Cost Keeping the Basis of Prosperity. Harry Franklin Porter. (9) June.  
 Industrial Preparedness. Spencer Miller. (55) June.  
 The Evolution of Public Utilities. George P. Roux. (9) June.  
 Reform and Regulation. Alexander C. Humphreys. (109) June.  
 Some of the Absurdities of the Straight Line Method of Determining Depreciation. Jenks B. Jenkins. (23) June 2.  
 Sulphate of Ammonia and Benjol.\* D. Bagley. (22) June 2.  
 Camping Instructions and Outfit Required for Construction Crews. Walter H. Meier. (86) June 7.  
 Accounting for the Contractor, the Columnar Journal. Benjamin L. Lathrop. (14) June 10.  
 The Slide-Rule Replaced by a New Computer.\* Yu Wang. (13) June 15.  
 Wood Waste and Other Pulpwoods Used in 1914 by United States Mills. Henry E. Surface. (105) June 15.  
 The Densitometer.\* G. A. Shakespear. (11) June 16.  
 Estimation of Benzene and Toluene in Commercial Mixtures. A. Edwards. (Paper read before the Soc. of Chemical Industry.) (66) June 20.  
 Municipal and Sanitary Engineering Service. G. R. Bascom. (86) June 21.  
 Waste. R. O. Wynne-Roberts. (96) June 22.  
 Figuring Expenses and Profits in Contracting. O. G. Pack. (27) June 24.  
 The Spruce Gum Industry.\* Samuel J. Record. (46) June 24.  
 Progress in International Standardization. C. le Maistre. (27) June 24.  
 Theory of Public Utility Franchises. George McLean. (Paper read before the Iowa District Gas Assoc.) (24) June 26.  
 The Executive and the Modern Organization. Dwight T. Farnham. (9) Serial beginning July.  
 Industrial Preparedness and the Engineer. William L. Saunders. (9) July.  
 The Projecting Lantern.\* John B. Taylor. (Paper read before the Illuminating Eng. Soc.) (19) July 1.  
 Accounting for the Contractor, the Balance Sheet. Benjamin L. Lathrop. (14) July 1.  
 Motor Trucks for Earth Excavation for the Public Service Terminal, Newark, N. J.\* (86) July 5.  
 Buying Material on a Scientific Basis. H. B. Twyford. (20) July 6.  
 Aerography the Science of the Structure of the Atmosphere.\* Alexander McAdie. (From the *Geographical Review*.) (19) July 8.  
 Accounting for the Contractor, Equipment Account.\* Benjamin L. Lathrop. (14) Serial beginning July 8.  
 Cost of Cost-Keeping Cut by Study of Office Force.\* Dan Patch. (14) July 8.  
 Saving Daylight, Economic Reasons That Make a Change in Our Hours of Work Desirable. G. F. Kuntz. (19) July 8.  
 Inaccurate Estimate Vitiates Time-Penalty Clause. (13) July 13.  
 How to Appraise Public Utility Property. George W. Kuhn. (17) July 15.  
 Ditching and Digging Pole Holes with Dynamite. Thomas M. Knight. (86) July 19.  
 Le Facteur Humain dans l'Organisation du Travail.\* James Hartness. (93) Sept. 1915.  
 La Rééducation Professionnelle des Blessés et des Mutilés de la Guerre.\* Jules Amar. (93) Oct. 1915.  
 Les Produits Dérivés des Goudrons de Houille.\* Daniel Florentin. (33) Serial beginning May 6.

**Municipal.**

- Review of New York State Work for 1915. H. E. Breed. (36) Apr.  
 Highway Maintenance and Repair. F. W. Sarr. (36) Apr.  
 Construction of Bituminous Roads. L. I. Hewes. (36) Apr.  
 Recent Advancement in the Construction of Brick Roads. Wm. C. Perkins. (36) Apr.  
 Concrete Roads. W. A. McIntyre. (36) Apr.  
 Earth Road Improvement. L. I. Hewes. (36) Apr.  
 Town Planning with Special Reference to the Doncaster District. Percy Morris. (114) No. 12, Apr.  
 Town Planning: Its Development and Utility. J. W. Cockrill. (114) No. 12, Apr.  
 Some Conclusions on Housing Our Workers.\* W. E. Riley. (114) No. 11, Apr.  
 The Principles and Position of Town Planning. W. R. Davidge. (Paper read before the Surveyors' Institution.) (104) Apr. 21.

\* Illustrated.



- Miscellaneous—(Continued).**
- The Chemical Analysis of Rubber Goods. Andrew H. Kline. (103) May 15.  
 Coasting for Blue-Pencil Paper. (119) May 20.  
 The Gasoline Question. (1103) May 20.  
 Do Engineers Need Standard Contract Forms Backed by National Societies? (14) May 27.  
 The Products Their Past and Future. J. Herbert Gannett. (Paper read before the Water and Sewerage Institute of Gas Engineers and Managers.) (100) May 30.  
 How to Study Factory Efficiency. J. K. Mason. (9) June.  
 Coal Keeping the Basis of Prosperity. Harry Franklin Foster. (9) June.  
 Industrial Preparation. Spencer Miller. (53) June.  
 The Evolution of Public Utilities. George P. Houss. (9) June.  
 Reform and Regulation. Alexander C. Humphreys. (109) June.  
 Some of the Aspects of the Straight Line Method of Determining Depreciation. (12) June 2.  
 Tanks R. Jenkins. (12) June 2.  
 Shipyard of Annapolis and Norfolk. D. Haskin. (12) June 2.  
 Camping Instructions and Other Hints for Construction Crews. Walter H. Meier. (80) June 7.  
 Accounting for the Contractor, the Chairman. Benjamin L. Lathrop. (14) June 10.  
 The Ship-Rails Replaced by a New Component. Y. W. Wang. (13) June 15.  
 Wood Waste and Other Polymers Used in 1914 by United States Mills. Henry E. Smith. (105) June 15.  
 The Production of A. A. Schuchman. (11) June 15.  
 Estimation of Reserves and Values in Commercial Mines. A. Edwards. (Paper read before the Soc. of Chemical Engineers.) (66) June 20.  
 Municipal and Sanitary Engineering Service. G. H. Bascom. (86) June 21.  
 Wastes. R. O. Wynne-Roberts. (90) June 22.  
 Plastics. R. O. Wynne-Roberts. (90) June 22.  
 The Spruce Gum Industry. George J. Haskin. (13) June 24.  
 Progress in International Standardization. G. J. Haskin. (13) June 24.  
 Theory of Public Utility Franchises. George J. Haskin. (Paper read before the Iowa District Gas Assoc.) (14) June 24.  
 The Executive and the Modern Organization. Dwight T. Farham. (9) Serial beginning July.  
 Industrial Preparation and the Executive. William L. Saunders. (9) July.  
 The Protective Language. John H. Taylor. (Paper read before the Illuminating Eng. Soc.) (19) July 1.  
 Accounting for the Contractor. Benjamin L. Lathrop. (14) July 1.  
 Motor Trucks for Earth Excavation for the Public Service Terminal. Newark, N. J. (80) July 2.  
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 (From the Geographical Review.) (19) July 8.  
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 In Factors Human dans l'Organisation du Travail. James Hartness. (93) July 13.  
 La Rééducation Professionnelle des Blessés et des Mutiles de la Guerre. Jules Amar. (93) Oct. 1915.  
 Les Produits Derivés des Goudrons de Houille. Daniel P. Foreman. (33) Serial beginning May 6.  
**Municipal.**  
 Review of New York State Work for 1915. H. E. Hurd. (30) Apr.  
 Highway Maintenance and Repair. E. W. Hart. (30) Apr.  
 Construction of Humulus Roads. L. E. Hurd. (30) Apr.  
 Recent Advancements in the Construction of Brick Roads. Wm. C. Perkins. (36) Apr.  
 Concrete Roads. W. A. McIntyre. (36) Apr.  
 Earth Road Improvement. L. E. Hurd. (30) Apr.  
 Town Planning with Special Reference to the Designer. David P. Ferry Morris. (114) No. 12. Apr.  
 Town Planning: Its Development and Utility. J. W. Cockfield. (114) No. 12. Apr.  
 Some Conclusions on Housing Our Workers. W. R. Rhyer. (114) No. 11. Apr.  
 The Principles and Position of Town Planning. W. R. Rhyer. (Paper read before the Surveyors' Institution.) (104) Apr. 21.  
 The Surveyors' Institution. (104) Apr. 21.

**Municipal—(Continued).**

- Recent Municipal Works and Practice in Hull.\* F. W. Bricknell. (114) No. 13, May.
- A Clarion Call to Engineers; Discussion of the Mechanics of City Planning.\* John E. Lathrop. (98) May.
- Municipal Asphalt Plant of Manhattan Boro, New York City.\* (60) May.
- Wood Blocks for Street Paving.\* (60) May.
- Caliche Roads: a New Type of Construction in Arizona.\* (13) May 4.
- California's Bituminous Carpeted Concrete Roads Show Durability in Service, Report States. (14) May 6.
- Construction of Gravel Roads by the Feather Edge Method.\* H. E. Bilger. (Abstract of paper read before the Conference on Highway Eng. at Kansas State Agricultural Coll.) (86) May 10.
- Water Supply for Concrete Pavement Construction. (86) May 10.
- Methods and Costs of Concrete Road Maintenance in Ohio. A. H. Hinkle. (86) May 10.
- City Planning at Cebu.\* R. C. Hardman. (13) May 11.
- Recent Developments in Bituminous Macadam and Bituminous Concrete Pavements. Arthur H. Blanchard. (Paper read before the Canadian and Inter. Good Roads Congress.) (96) May 11; (60) June.
- Lessons in Road Maintenance from New York State. T. M. Ripley. (13) May 11.
- Road and Bridge Construction and Maintenance in the Province of Nova Scotia.\* (Abstract from Report of the Highways Div.) (96) May 11.
- State Aid for Housing and Town Planning Schemes. W. E. Whyte and W. Ross Young. (Paper read before the Congress on Home Problems after the War.) (104) May 12.
- The Non-Such Tar Painting Outfit.\* (104) May 12.
- Effects of Low Temperature on Paving in the Track Allowance.\* (17) May 13.
- Pavement Near Car Lines Heaves during Cold Spell.\* J. Thomas Dovey. (14) May 13.
- Uniformity Required in Pavement Foundations. W. W. Crosby. (Abstract from paper read before the Canadian and Inter. Road Congress.) (86) May 17.
- Artificial Foundations for Pavements. W. W. Crosby. (Paper read before the Canadian and Inter. Road Congress.) (86) May 17.
- Increasing Water Works Efficiency Under City Manager Government. (86) May 17.
- System of Road Working in Warren County, Kentucky. M. H. Crump. (86) May 17.
- Retaining Walls on Bathurst Street Hill, Toronto.\* S. G. Talman. (96) May 18.
- Aprons Reduce Flood Damage to Road Shoulders.\* George E. Schaefer. (14) May 20.
- Asphalt Flush Coat Seals Porous Road Surface. (14) May 20.
- The Easton-Allentown Concrete Road; an Exceptional Example of Modern Road Engineering.\* Wm. D. Uhler. (Paper read before the Am. Road Builders' Assoc.) (86) May 24.
- Comparative Values of Various Approved Forms of Street Pavements and Roads. E. M. Re Qua. (86) May 24.
- Organization as Influenced by Plant of Concreting Gangs for Road Construction.\* Halbert P. Gillette. (Report of Committee of National Conference on Concrete Road Building.) (86) May 24.
- Method and Cost of Bitulithic Paving, Pierce Co., Wash.\* David H. White. (13) May 25.
- Width and Allocation of Space in Roads. F. Longstreth Thompson. (Paper read before the Town Planning Inst.) (96) May 25.
- Standard Nomenclature and Specifications for Tar and Pitch for Road Purposes. Engineering Standards Committee. (22) May 26.
- The Park-Development Problems in the Hard-Coal Region.\* Karl B. Lohman. (45) May 27.
- Concrete Paving a Remedy for Unsightly Alleys.\* John C. Hitesheiw. (14) May 27.
- Favors Mill-Bent Angle-Iron as Concrete Road Screed. (14) May 27.
- Highway Construction in Washington by Convict Labor. (86) May 31.
- Practice of Peoria Ry. Co., Peoria, Ill., for Paving Street Railway Tracks. R. F. Palmblade. (Paper read before the Illinois Soc. of Engrs. and Surveyors.) (86) May 31.
- Highway Problems of the State of Pennsylvania. William D. Uhler. (3) June.
- The Quincy Shore Boulevard of the Boston Metropolitan Park Commission.\* (60) June.
- Building Concrete Roads. Homer P. Cumings. (Paper read before the Ohio Eng. Soc.) (60) June.
- Prompt Snow Removal in Philadelphia, Pa.\* William H. Connell. (60) June.
- Minimum Tire Widths for Good Roads. Harold L. Hock. (36) June.
- Chicago has New Shop Plant for All Public Works.\* C. C. Sauer. (13) June 1.
- Practical Maintenance of Road Plants.\* M. E. Fafard. (Abstract of paper read before the Third Canadian and Inter. Good Roads Congress.) (96) June 1.

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- Municipal (Continued).
- Recent Municipal Works and Practice in Hall. F. W. Bricknell. (114) No. 13.
- A. C. Clark Call to Engineers: Discussion of the Mechanics of City Planning. John May. (92) May.
- Municipal Asphalt Plant of Manhattan Hotel, New York City. May. (60) May.
- Wood Hoek for Street Laying. (60) May.
- California Roads: A New Type of Construction in Arizona. (11) May 4.
- California: Recent Concrete Roads Show Durability in Service.
- Report. (14) May 6.
- Construction of Gravel Roads by the Feather Edge Method. H. E. Hiler. (Abstract of paper read before the Conference on Highway Eng. at Kansas State Agricultural Coll.) (86) May 10.
- Water Supply for Concrete Pavement Construction. (86) May 10.
- Methods and Costs of Concrete Road Maintenance in Ohio. A. H. Hinkle. (86) May 10.
- City Planning at Cedar. R. C. Hardman. (11) May 11.
- Recent Pavements in Birmingham, Macadam and Bituminous Concrete Pavements. Arthur B. Hinchey. (Paper read before the Canadian and Inter. Good Roads Congress.) (96) May 11.
- Lawson in Road Maintenance from New York State. T. M. Ripley. (11) May 11.
- Road and Bridge Construction and Maintenance in the Province of Nova Scotia. (Abstract from Report of the Highway Div.) (96) May 11.
- State Aid for Housing and Town Planning Schemes. W. E. Wills and W. Ross Young. (Paper read before the Congress on Home Problems after the War.) (104) May 12.
- The New South-Tar Paving Outfit. (104) May 12.
- Effects of Low Temperature on Paving in the Truck Allowance. (11) May 13.
- Pavement Near Gas Lines Heated during Cold Spell. J. Thomas Doney. (14) May 13.
- Unusually Rapid in Pavement Foundations. W. W. Crosby. (Abstract from paper read before the Canadian and Inter. Road Congress.) (86) May 17.
- Artificial Foundations for Pavements. W. W. Crosby. (Paper read before the Canadian and Inter. Road Congress.) (86) May 17.
- Investing Water Works Emergency Under City Manager Government. (86) May 17.
- System of Road Working in Warren County, Kentucky. M. H. Crump. (86) May 17.
- Retaining Walls on Bathurst Street Hill, Toronto. S. G. Talmann. (96) May 18.
- Approximate Damage to Road Structures. George E. Schneider. (14) May 20.
- Asphalt Paving Costs for Toronto Road Surface. (14) May 20.
- The Eastern-Alberta Concrete Road, an Exceptional Example of Modern Road Engineering. Wm. D. Under. (Paper read before the Am. Road Builders Assoc.) (86) May 24.
- Comparative Values of Various Approved Forms of Street Pavements and Roads. E. M. De Que. (86) May 24.
- Organization as Influenced by Kind of Constructing Gangs for Road Construction. Harold T. Gillette. (Report of Committee of National Conference on Concrete Road Building.) (86) May 24.
- Method and Cost of Bituminous Paving. Pierce Co. Wash. David H. White. (11) May 25.
- Width and Allocation of Space in Roads. F. Langkath Thompson. (Paper read before the Town Planning Inst.) (96) May 25.
- Standard Nomenclature and Specifications for Tar and Pitch for Road Purposes. Engineering Standards Committee. (11) May 26.
- The Park Development Problems in the Hard-Coal Region. Karl H. Lohman. (42) May 27.
- Concrete Paving a Remedy for Unstable Alloys. John C. Hirschew. (14) May 27.
- Factor Mill-Bent Angle-Iron as Concrete Road Screed. (14) May 27.
- Highway Construction in Washington by Concrete Labor. (86) May 31.
- Practice of Paving R. Y. Co. Paving, Ill., for Paving Street Railway Tracks. R. F. Tumbach. (Paper read before the Illinois Soc. of Eng. and Surveyors.) (86) May 31.
- Highway Problems of the State of Pennsylvania. William D. Under. (3) June.
- The Quincy State Boulevard of the Boston Metropolitan Park Commission. (96) June.
- Building Concrete Roads. Homer F. Cummings. (Paper read before the Ohio Eng. Prom. Snow Removal in Philadelphia. Pa. William H. Connell. (60) June.
- Minimum Time Within for Good Roads. Harold A. Hoek. (36) June.
- Chicago has New Shop Plant for All Public Works. C. C. Bauer. (11) June 1.
- Practical Maintenance of Road Plants. M. E. Palmer. (Abstract of paper read before the Third Canadian and Inter. Good Roads Congress.) (96) June 1.

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**Municipal—(Continued).**

- Brick and Asphalt Paving by Day Labor. G. C. Brehm. (13) June 1.  
 Rolling Important for Asphalt-Gravel Roads. A. P. Rice. (Abstract of paper read before the Mass. Highway Comm.) (14) June 3.  
 Asphaltic Concrete Pavements. D. T. Pierce. (17) June 3.  
 Waterbound Macadam Tarsurfaced Stands Heavy Traffic. (14) June 3.  
 The Regeneration of Powdertown.\* (76) June 6.  
 Planning the Industrial Town of Iroquois Falls, Ontario.\* A. P. Melton. (86) June 7.  
 Standard Units for Comparing Municipal Improvements. A. Prescott Folwell. (Paper read before the Annual Conference of Mayors of the State of New York.) (86) June 7.  
 Annual Report on Highway Improvement in Ontario. (96) June 8.  
 City Paving Compared with Contract Work. Adolph F. Meyer. (Abstract from *Bulletin*, Civ. Engrs. Soc. of St. Paul.) (13) June 8.  
 Public Works Accounting for Villages and Towns.\* Charles A. Holden. (13) June 8.  
 Road Culverts in Quebec Province. Alexander Fraser. (Abstract of paper read before the Inter. Road Congress.) (96) June 8.  
 Surrey Bituminous Road Surfacing Scheme, Materials, Methods and Details of Cost. (104) June 9.  
 Good Roads and the Automobile.\* A. M. Jungmann. (19) June 10.  
 City Makes Money by Purchasing Plant and Laying its Own Asphalt Paving.\* Clarence E. Ridley. (14) June 10.  
 John Nolen Says City Planning is for Small Cities as well as for Large Ones. (Abstract of paper read before the National Conference on City Planning.) (14) June 10.  
 Hydrated Lime in Concrete Pavements.\* G. Cameron Parker. (86) June 15.  
 Maintaining the Washington-Atlanta Highway.\* (14) June 17.  
 Pour Filler over Blocks in Granite Pavement. (14) June 17.  
 Construction Features of an Asphaltic Macadam Road in Massachusetts.\* E. H. Townsend. (Paper read before the Mass. Highway Comm.) (86) June 21.  
 Modern Brick Road Construction. H. E. Bilger. (Paper read before the Conference on Highway Eng. at Kansas State Agricultural Coll.) (86) June 21.  
 Road Maintenance, Materials and Methods. William H. Connell. (Paper read before the Canadian and Inter. Good Roads Congress.) (96) June 22.  
 Automobiles, Motor Trucks and City Planning. Nelson P. Lewis. (Abstract of paper read before the City Planning Conference.) (13) June 22.  
 County Marks its Roads with Simple Signs; Main Plate Carried by 2-Inch Pipe Anchored in Post Hole by Grout and Rock Filling.\* (14) June 24.  
 Simplicity the Keynote of Oregon's Cost-Keeping System.\* G. Ed. Ross. (14) June 24.  
 Making Roads and Men.\* O. R. Geyer. (19) June 24.  
 New Pavement Construction on Queensboro Bridge, New York City. (86) June 28.  
 Gravel Roads Constructed in Northwestern Michigan. L. H. Neilson. (Paper read before the Battle Creek Highway Convention.) (86) June 28.  
 San Francisco's Civic Center.\* (13) June 29.  
 Old Gravel and Macadam for Brick Pavement Foundation. H. E. Bilger. (Abstract from *Illinois Highways*.) (13) June 29.  
 Mysteries of Concrete Road Construction. W. H. Reed. (60) July.  
 Bitulithic Pavement Laid Over Old Gravel Road.\* David H. White. (14) July 1.  
 The Columbia River Highway.\* (19) July 1.  
 The Clayton County, Iowa, Patrol System for Maintenance of Dirt Roads. Edward B. Tourtellot. (From *Service Bulletin*, Iowa Highway Comm.) (86) July 5; (14) May 13.  
 Methods and Cost of Treating Old Macadam Streets in Milwaukee, Wis., with Asphaltic Oil.\* Stanley E. Bates. (86) July 5.  
 Cutting Haulage Cost in Road Work to Seven Cents Per Ton-Mile. G. N. Lamb. (86) July 5.  
 Comparative Cost of Various Types of Pavement.\* Eugene W. Stern. (Paper read before the Second National Conference on Concrete Road Bldg.) (86) July 5.  
 Organization and Output of a Gang Laying Concrete Base for Asphalt Pavement.\* W. D. Jones. (86) July 5.  
 Asphalt Macadam Construction in Lake County, Indiana. (86) July 5.  
 Portable Washing Plant for Preparing Aggregates for Concrete Road Construction. H. Collin Campbell. (86) July 5.  
 Some Comparative Tests of Wire-Cut-Lug and Repressed Paving Brick. Wm. A. Goss. (86) July 5.  
 Miscellaneous Street Signs.\* (13) July 6.  
 Excess Condemnation and City Planning.\* Charles K. Mohler. (13) July 6.  
 Brick Pavement Carries 4492 Vehicles a Day. (14) July 8.  
 Steam Shovel Removes and Loads Old Pavement and Foundation.\* (14) July 8.  
 Changes in New Specifications for Paving in St. Louis. (13) July 13.  
 Hamilton Entrance of Toronto-Hamilton Highway.\* E. Howard Darling. (96) July 13.

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## Municipal—(Continued).

- Brick and Asphalt Paving by Day Labor. G. C. Brehm. (13) June 1.  
 Rollins Report for Asphalt-Gravel Roads. A. F. Rice. (Abstract of paper read before the Mass. Highway Comm.) (14) June 8.  
 Asphalt Concrete Pavements. D. T. Pierce. (17) June 8.  
 Waterbound Macadam Paved Roads Heavy Traffic. (14) June 8.  
 The Resurfacing of Portland Cement. (15) June 8.  
 Planning the Industrial Town of Iroquois Falls, Ontario. A. F. Mellon. (80) June 7.  
 Standard Data for Comparing Municipal Improvements. A. Prescott Folwell. (Paper read before the Annual Conference of Mayors of the State of New York.) (80) June 7.  
 Annual Report on Highway Improvement in Ontario. (90) June 8.  
 City Paving Compared with Contract Work. Adolph F. Meyer. (Abstract from Bulletin, Civ. Engrs. Soc. of St. Paul.) (13) June 8.  
 Public Works Accounting for Villages and Towns. Charles A. Holden. (13) June 8.  
 Road Closures in Quebec Province. Alexander Fraser. (Abstract of paper read before the Inter. Road Congress.) (90) June 8.  
 Survey Birmingham Road Bunting Scheme. Materials Methods and Details of Cost. (104) June 8.  
 Good Roads and the Automobile. A. M. Langmann. (19) June 10.  
 City Makes Money by Purchasing Plant and Laying its Own Asphalt Paving. (Abstract of paper read before the National Conference on City Planning.) (14) June 10.  
 Hydrated Lime in Concrete Pavements. G. Cameron Parker. (80) June 10.  
 Maintaining the Washington-Albany Highway. (14) June 17.  
 Four Filter over Blocks in Granite Pavement. (14) June 17.  
 Construction Features of an Asphaltic Macadam Road in Massachusetts. E. H. Townsend. (Paper read before the Mass. Highway Comm.) (80) June 21.  
 Modern Brick Road Construction. H. E. Bigger. (Paper read before the Conference on Highway Eng. in Kansas State Agricultural Coll.) (80) June 21.  
 Road Structures, Materials and Methods. William H. Conner. (Paper read before the Canadian and Inter. Good Roads Congress.) (90) June 22.  
 Automobiles, Motor Trucks and City Planning. Nelson P. Jewett. (Abstract of paper read before the City Planning Conference.) (13) June 22.  
 County Makes its Roads with Simple Signs. Main Plate Carried by 2-Inch Pipe. (Abstract of paper read before the National Conference on City Planning.) (14) June 24.  
 Simultaneous the Keynote of Oregon's Good-Roads System. G. E. Ross. (14) June 24.  
 Making Roads and Mac. O. R. Geyer. (19) June 24.  
 New Pavement Construction on Queensboro Bridge, New York City. (80) June 25.  
 Gravel Roads Constructed in Northwestern Michigan. L. H. Nelson. (Paper read before the Harris Creek Highway Convention.) (80) June 28.  
 San Francisco's Civic Center. (13) June 29.  
 Old Gravel and Macadam for Brick Pavement Foundation. H. E. Bigger. (Abstract from Illinois Highway.) (13) June 29.  
 Migration of Concrete Road Construction. W. H. Reed. (60) July 1.  
 Brimbleton Pavement Laid Over Old Gravel Road. David H. White. (14) July 1.  
 The Columbia River Highway. (19) July 1.  
 The Clayton County, Iowa, Patrol System for Maintenance of Dirt Roads. Edwards H. Torrance. (From North Dakota Highway Comm.) (80) July 5.  
 Methods and Cost of Treating Old Macadam Streets in Milwaukee, Wis., with Asphaltic Oil. Stanley R. Bates. (80) July 5.  
 Cutting Haulage Cost in Road Work to Seven Cents Per Ton-Mile. G. N. Lamb. (80) July 5.  
 Comparative Cost of Various Types of Pavement. Eugene W. Stern. (Paper read before the Second National Conference on Concrete Road Bldg.) (80) July 5.  
 Organization and Output of a Gang Laying Concrete Base for Asphalt Pavement. W. D. Jones. (80) July 5.  
 Asphalt Macadam Construction in Lake County, Indiana. (80) July 5.  
 Portable Washing Plant for Treating Aggregates for Concrete Road Construction. H. Colin Campbell. (80) July 5.  
 Some Comparative Tests of Wire-Cut-Lime and Replaced Paving Brick. Wm. A. Goss. (80) July 5.  
 Miscellaneous Street Signs. (13) July 5.  
 Kansas Commission and City Planning. Charles K. Mohler. (13) July 5.  
 Brick Pavement Carries 482 Vehicles a Day. (14) July 5.  
 Steam Shovel Removes and Loads Old Pavement and Foundation. (14) July 5.  
 Changes in New Specifications for Paving in St. Louis. (13) July 12.  
 Hamilton Entrance of Toronto-Hamilton Highway. E. Howard Darling. (90) July 12.

\* Illustrated.



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- Drainage and Preparation of Subgrade. (Report to the National Congress on Concrete Road Building.) (96) July 13.  
 Motor Truck Lessens Cost of Maintaining Gravel Roads in Alabama.\* Thomas H. Edwards. (14) July 15.  
 Harrowing Highly Important in Gravel Roads. H. E. Bilger. (14) July 15.  
 Concrete Road Develops Three Cracks in a Year. (14) July 15.  
 Prorating Paving Costs Among Property Owners.\* H. M. Talbott. (13) July 16.  
 Cost Analysis of Asphaltic-Concrete Pavements. (13) July 20.  
 Fortschritte auf dem Gebiete des Strassenbauwesens in Amerika. Karl Haller. (39) Serial beginning Mar. 5.  
 Bebauungsplan für ein städtisches Gelände an der Uellendahler Strasse und Kohlstrasse in Elberfeld im Hinblick auf seinen Werdegang.\* Voss. (39) Serial beginning Mar. 5.  
 Die Korrektur der Pierre-Pertuis-Strasse.\* (107) Apr. 22.

**Railroads.**

- Electrification of Railroads. W. F. M. Goss. (61) Feb. 15.  
 Locomotive Inspection Laws. Frank McManamy. (61) Mar. 21.  
 A Recent Air Brake Trial on the P. R. R. R. D. Kavanaugh. (2) Apr.  
 Test of Locomotives.\* D. R. MacBain. (61) Apr. 18.  
 Concealed Damage. W. H. Streeter. (Paper read before the United Yard Masters' Assoc.) (23) Apr. 21.  
 Electrification on the Norfolk and Western Railway.\* (12) Apr. 21.  
 The Furka Pass Railway.\* (12) Apr. 21.  
 The Lothians Railways.\* (23) Apr. 21.  
 Commercial Motor Vehicles for Railway and Industrial Purposes. (23) Serial beginning Apr. 28.  
 The 2-Ft. Gauge Gwalior Light Railways, Central India.\* (23) Apr. 28.  
 2-6-2 Tank Locomotives, Assam-Bengal Railway.\* (23) Apr. 28.  
 Passenger Terminal Inspection.\* R. S. Mounce. (25) May.  
 Handling a Big Engine Terminal. Paul A. Schenck. (25) May.  
 The Sanitation of Railway Cars. Thomas R. Crowder. (65) May.  
 Northern Pacific Express Cars.\* (25) May.  
 Railroad Day and Night Signals. B. H. Mann. (115) May.  
 The Cause of Slid Flat Wheels.\* Walter V. Turner. (Abstract of paper read before the St. Louis Ry. Club.) (25) May.  
 Test of the Young Valve and Valve Gear.\* (25) May.  
 The Use of Continuous Current for Terminal and Trunk-Line Electrification.\* Norman Wilson Storer. (77) May 1.  
 Ballasting Track by Contract.\* (13) May 4.  
 The Garratt Locomotive.\* H. W. Dearberg. (Paper read before the Institution of Locomotive Engrs.) (23) May 5.  
 New 4-6-0 Type Locomotives, London & Northwestern Railway.\* (23) May 5.  
 Concrete Work on the Arizona Division of the Santa Fe.\* (23) May 5.  
 Canadian Railways in the Eventful Year 1915. J. L. Payne. (15) May 5.  
 How French Hospital Trains Help to Save the Wounded. (23) May 5.  
 A Long Tunnel in British Columbia. (12) May 5.  
 Intercepting Valve for Mallet Locomotives.\* (15) May 5.  
 Mallet Articulated Locomotives for the Nashville, Chattanooga & St. Louis Ry.\* (18) May 6; (15) May 5.  
 West Side Improvement Plans of New York Central Railroad in New York Filed.\* (14) May 6.  
 The Government Railroad in Alaska, What Two Years and Limited Funds Have Accomplished.\* Thomas Riggs, Jr. (14) May 6.  
 Routing Systems in the Small Shop.\* H. D. Wolcomb. (18) May 6.  
 Results Obtained with Roller Bearings on Interurban Cars.\* W. B. Voth and A. C. Metcalfe. (17) May 6.  
 Caboose Cars for the Nashville, Chattanooga & St. Louis Ry.\* (18) May 6.  
 Detroit River Tunnel Operation.\* (17) May 6.  
 Reduction of Dynamic Argument. (18) May 6.  
 Safety Appliance Act not Limited to Equipment Being Used in Interstate Commerce. (18) May 6.  
 Scrap and Reclamation on the Pennsylvania Lines, East.\* (18) May 6.  
 Saratoga Terminal Completed.\* (17) May 6.  
 Proposed Improvement of New York's Hudson River Front, Eliminating Railroad Operation at Street Grades.\* (46) May 6.  
 New Locomotives for the Japanese State Railways. (23) May 12.  
 Lateral Stresses on Rails in Curves.\* George L. Fowler. (23) May 12.  
 Long Freight Trains and Railway Accidents; a Study of the Relation Between Train Length and Accidents to Trains and Casualties to Persons. (From *Bulletin*, Bureau of Ry. Economics.) (15) May 12.  
 Locomotive Impact Tests on the Burlington.\* C. B. Young. (15) May 12; (25) June.  
 Slack Action in Long Passenger Trains. (Paper read before the Air Brake Assoc.) (15) May 12; (25) June.

\* Illustrated.

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**Railroads—(Continued).**

- Consolidation Locomotives for the Lake Superior & Ishpeming Ry.\* (18) May 13; (25) July; (15) June 16.
- Is the Ton-Mile the Proper Basis for Allocating Railroad Operating Costs? Paul M. La Bach. (14) May 13.
- Federal Regulation, Including the Labor Problem. Daniel Willard. (Paper read before the Am. Newspaper Publishers' Assoc.) (18) May 13.
- Signaling in the Public Service Terminal.\* J. W. Brown. (17) May 13.
- The Function of Federal Valuation in Rate Making.\* C. C. James. (Paper read before the Railroad Men's Improvement Assoc. of New York.) (18) May 13.
- New 0-6-2 Type Tank Engines, Glasgow & South Western Railway.\* (23) May 19.
- The Strength and Wear of Locomotive Tires. E. L. Ahrons. (Paper read before the Institution of Locomotive Engrs.) (12) Serial beginning May 19.
- Buildings and Structures. (Report of Committee of the Inter. Ry. Fuel Assoc.) (15) May 19.
- Report of Committee of the Inter. Ry. Fuel Assoc. on Powdered Fuel.\* (15) May 19.
- An Operating Study of the Rock Island.\* (15) May 19.
- The Pacific Electric Railway.\* (23) May 19.
- Report on Amherst Collision. (From Report of the Interstate Commerce Comm.) (15) May 19.
- L. & N. W. R. Ambulance Train Vehicles for Service on the Continent.\* (23) May 19.
- Central Argentine Electrification. (From *Central Argentine Railway Magazine*.) (26) May 19.
- Powdered Fuel. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 19; (18) May 20; (25) June; (47) June 16.
- How to Secure Safety in the Shop. (Abstract of paper read before the Inter. Eng. Congress.) (47) May 19.
- Reclamation. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 19; (25) June.
- Three Position Signals, Victorian Government Railways.\* (23) May 19.
- Report of Committee on Lumber of the Inter. Ry. Fuel Assoc. (15) May 19; (25) June.
- The Eymon Continuous Crossing.\* (18) May 20.
- Rail Weights Reduced to Lengths, and Vice Versa, Tables Compiled for Converting Linear Feet of Eighteen Sections into Tonnages, and Tonnages into Track Miles. James G. Wishart. (14) May 20.
- The Difficulties of Railroad Maintenance in Alaska.\* Kirk McFarlin. (46) May 20.
- The Effectiveness of Coasting Recorders in Reducing Power Consumption and Operating Costs. V. W. Berry. (17) May 20.
- Traffic Development on the Scranton & Binghamton R. R.\* (17) May 20.
- The Railroad Fuel Problem, Past and Present. S. M. Felton. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 20.
- Care of Locomotives with Relation to Fuel Economy. A. N. Willisie. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 26; (25) June.
- New Locomotives for the Leopoldina Railway.\* (23) May 26.
- A New Passenger Station at Buenos Aires.\* (15) May 26.
- Some Features of the Bombay, Baroda & Central India Railway in 1863.\* (23) May 26.
- Fuel Stations.\* (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 26.
- The Shildon-Newport Railway Electrification.\* (26) Serial beginning May 26; (11) May 26; (22) May 26.
- The First Electrified Mineral Line in England.\* (23) Serial beginning May 26.
- A Heavy Freight Electric Power Railway.\* F. C. Coleman. (57) May 26.
- Fuel Economy and the Transportation Officer. W. H. Averell. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 26; (18) May 20.
- Railways in a System of National Defense. W. L. Park. (Paper read before the Inter. Assoc. of Ry. Special Agents and Police.) (15) May 26.
- Economics of Crossties Reduced to Figures.\* (14) May 27.
- Prospective Development and Earnings Affect the Value of a Railroad.\* R. B. Shepard, Jr. (14) May 27.
- The Ureco Refrigerator Brine Tank Valve (for Cans).\* (18) May 27; (25) June.
- Economy Pony and Trailing Trucks for Locomotives.\* (18) May 27.
- Some Notes on Signal Maintenance. A. G. Shaver. (18) May 27.
- Test of the Julian-Beggs Train Control Signal System.\* (18) May 27.
- Recovering a Wrecked Pacific Locomotive.\* (21) June.
- A Novel Portable Electric Rail Grinder.\* Frank C. Perkins. (108) June.
- Efficiency of Railroad Operation. Samuel B. Dunn. (Paper read before the Inter. Ry. Fuel Assoc.) (15) June.
- The Handling of Equipment on the Baltimore & Ohio. F. F. Hanly. (87) June.
- Lehigh Valley Maintenance Methods.\* (87) June.
- Organizing and Handling Crews for Ballast Work. S. J. Evans. (87) June.
- Train Lighting by Electricity.\* (21) Serial beginning June.

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- Consolidation locomotives for the Lake Superior & Ishpeming Ry. (18) May 18; (25) June 18.
- Is the Ton-Mile the Proper Basis for Allocating Railroad Operating Costs? Paul M. La Roche. (14) May 18.
- Federal Regulation, including the Labor Problem. Daniel Willard. (Paper read before the Am. Newspaper Publishers' Assoc.) (18) May 18.
- Stagnation in the Public Service Termination. J. W. Brown. (17) May 18.
- The Function of Federal Regulation in Rate Making. C. G. James. (Paper read before the National Men's Improvement Assoc. of New York.) (18) May 18.
- New 6-6-2 Type Tank Locomotives. Glasgow & South Western Railway. (23) May 18.
- The Strength and Wear of Locomotive Tires. E. L. Atkinson. (Paper read before the Institution of Locomotive Engineers.) (17) Serial beginning May 18.
- Buildings and Structures. Report of Committee of the Inter. Ry. Fuel Assoc. (18) May 18.
- Report of Committee of the Inter. Ry. Fuel Assoc. on Powdered Fuel. (18) May 18.
- An Operating Study of the Rock Island. (15) May 18.
- The Pacific Electric Railway. (23) May 18.
- Report on Amtrak Collection. From Report of the Interstate Commerce Comm. (18) May 18.
- J. & N. W. H. Automobile Train Vehicles for Service on the Continent. (23) May 18.
- Central American Electricification. (From Central American Railway Magazine.) (20) May 18.
- Powdered Fuel. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 18; (18) May 20; (25) June 18; (47) June 18.
- How to Secure Safety in the Shop. Abstract of paper read before the Inter. Ry. Fuel Assoc. (47) May 18.
- Reclamation. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 18; (25) June.
- Three Position Signals. Victorian Government Railways. (23) May 18.
- Report of Committee on Lumber of the Inter. Ry. Fuel Assoc. (18) May 18; (25) June.
- The Lumbermen's Crossing. (18) May 20.
- Hill Wrecked Loaded to Capacity and Vice Versa. Tables Compiled for Converting Linear Feet of Switched Sections into Tonnages and Tonnages into Track Miles. James G. Whitcomb. (14) May 20.
- The Difficulties of Railroad Maintenance in Alaska. Kirk McFarlane. (40) May 20.
- The Effectiveness of Costing Records in Reducing Power Consumption and Operating Costs. V. W. Berry. (17) May 20.
- Traffic Development on the Seaboard & Wilmington R. R. (17) May 20.
- The Railroad Fuel Problem. Paul and Freeman. S. M. Feltton. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 20.
- Care of Locomotives with Relation to Fuel Economy. A. N. Whittle. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 20; (25) June.
- New Locomotives for the Lehigh Valley. (23) May 20.
- A New Passenger Station at Tucson, Arizona. (18) May 20.
- Some Features of the Bombay, Baroda & Central India Railway in 1903. (14) May 20.
- Fuel Stations. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 20.
- The Seaboard New York Railway Electricification. (20) Serial beginning May 20; (11) May 20; (25) May 20.
- The First Electrified Mine in England. (23) Serial beginning May 20.
- A Heavy Freight Electric Locomotive. W. H. Averell. (27) May 20.
- Fuel Economy and the Transportation Officer. W. H. Averell. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 20; (18) May 20.
- Railways in a System of National Defense. W. L. Park. (Paper read before the Inter. Ry. Fuel Assoc.) (18) May 20.
- Economics of Gravelled Roads. (14) May 27.
- Prospective Development and Earnings. Effect the Value of a Railroad. R. H. Shepard. (14) May 27.
- The Three Reintegrator Valve Tank Valve (for Cans). (18) May 27; (25) June.
- Economy Pans and Traction Trucks for Locomotives. (18) May 27.
- Some Notes on Steam Maintenance. A. G. Shaver. (18) May 27.
- Test of the Lullin-Hicks Train Control System. (18) May 27.
- Reconstruction of a Wrecked Pacific Locomotive. (21) June.
- A Novel Portable Electric Rail Grinder. Frank C. Perkins. (108) June.
- Equipment of Railroad Operation. Samuel H. Dunn. (Paper read before the Inter. Ry. Fuel Assoc.) (18) June.
- The Handling of Equipment on the Baltimore & Ohio. F. F. Hanley. (87) June.
- Latent Valley Maintenance Methods. (87) June.
- Operating and Handling Crews for Railroad Work. S. J. Evans. (87) June.
- Train Labeling by Electricity. (21) Serial beginning June.

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- Terminal Cleaning of Passenger Cars. J. E. Ross. (25) June.  
 Dismantling of Cars. J. W. Gerber. (Paper read before the Ry. Storekeepers' Assoc.) (25) June.  
 The Safe Lock Switch Machine.\* (87) June.  
 Functions of a Railroad Fuel Inspector. Eugene McAuliffe. (Paper read before the Inter. Ry. Fuel Assoc.) (15) May 19; (18) May 20; (25) June.  
 The Human Fireman. Ralph Bradley. (Paper read before the Inter. Ry. Fuel Assoc.) (25) June; (18) July 8.  
 A New Track Fastening.\* (87) June.  
 Protecting Track from Drifting Sand. Southern Pacific R. R.\* (87) June.  
 Rogers Pass Soft-Ground Work.\* J. G. Sullivan. (13) June 1.  
 Garratt Locomotive for Brazil.\* (23) June 2.  
 The Operation of the Railroads in New England. (Abstract of paper read before the New England R. R. Club.) (15) June 2.  
 Rail Manufacture. J. S. Unger. (Paper read before the Am. Iron and Steel Inst.) (15) June 2; (116) June; (18) July 15.  
 Mikado Type Locomotives for the Atchison, Topeka & Santa Fe Ry.\* (18) June 3.  
 Method of Handling Repairs to Foreign Cars and Billing for Same.\* E. S. Way. (Paper read before the Ry. Club of Pittsburgh.) (18) June 3.  
 Treatment of Feed Water for Locomotive Boilers. L. F. Wilson. (Paper read before the Cincinnati Ry. Club.) (18) June 3.  
 New Locomotives for the Midl Railway.\* (17) June 3.  
 Water-Filled Asphalt on the Baltimore & Ohio R. R.\* (13) June 8.  
 Flue-Reclaiming System of the Santa Fe Shops.\* Ethan Viall. (72) June 8.  
 Some Small American Petrol Locomotives.\* (12) June 9.  
 South African Railways' Locomotives.\* (23) Serial beginning June 9.  
 Northern Pacific Express Refrigerator Cars.\* (15) June 9.  
 Italy's Numerous Accidents Resulting from Unpreparedness. Walter S. Hiatt. (15) June 9.  
 Power Brakes for Goods Trains.\* (23) June 9.  
 Steel Coaches for Long Island Suburban Service.\* (23) June 9.  
 The Design of Plants for Dumping Coal Cars.\* J. F. Springer. (15) June 9.  
 L. C. L. Freight Handling Methods at Silvis Transfer, Ill.\* (15) June 9.  
 Prevention of Accidents at Grade Crossings. (Paper read before the Am. Ry. Assoc.) (15) June 9.  
 Conference on Wage Demands of Train Employees. (15) Serial beginning June 9.  
 Santa Fe Type Locomotives for the Erie Railroad.\* (18) June 10; (25) May.  
 New Railroad Terminal in New Orleans Now Open.\* (14) June 10; (15) June 2.  
 Making Railway Rails Continuous by Means of the Electric Arc. (46) June 10.  
 Locomotive Repair Shops and Classification Yard, Lehigh & New England R. R., Pen Argyl, Pa.\* (18) June 10.  
 Application of Ball Bearings to Railway Car Journals. O. Bruenauer. (Abstract of paper read before the Illinois Elec. Rys. Assoc.) (17) June 10.  
 New Interurban and Work Cars for the K. C. C. C. & St. J. Ry.\* J. N. Spellman. (17) June 10.  
 Baltimore & Ohio Adds Second Dynamometer to Car; Diaphragm Type Instrument Indicates Both Pulling and Buffing Forces, and is Sensitive to Small Variations. (14) June 10.  
 Operation on the Baltimore & Ohio Electrification.\* (17) June 10.  
 Electric Locomotive Drives.\* F. H. Shepard. (17) June 10.  
 Heating Boilers for Electric Locomotives.\* (17) June 10.  
 Performance of Converted Locomotives on the Kansas City Southern Ry.\* (18) June 10.  
 Report on Train Brakes and Train Air Signals.\* (Report of the Committee on Train Brakes and Train Air Signals of the Master Car Builders' Assoc.) (15) June 15.  
 Brake Shoe and Brake Beam Equipment.\* (Report of Committee of the Master Car Builders' Assoc.) (15) June 15; (18) June 17.  
 Settlement Prices for Reinforced Wooden Cars. (Report of Committee of the Master Car Builders' Assoc.) (15) June 15.  
 Filling Trestles on an Electric Railway.\* (13) June 15.  
 Report on Standards and Recommended Practice.\* (Report of Committee of the Master Car Builders' Assoc.) (15) June 15.  
 Locomotive Front Ends, Grates and Ashpans. (Paper read before the Inter. Ry. Fuel Assoc.) (47) June 16.  
 Grade Crossing Elimination at Cleveland.\* (15) June 16.  
 Where German Efficiency Falls Down.\* H. W. Faus. (15) June 16.  
 Accidents at Grade Crossings and to Trespassers. Alex. Gordon. (Paper read before the Board of Supervisors of California.) (15) June 16.  
 Report of the Committee on Train Lighting and Equipment of the Master Car Builders' Assoc.\* (15) June 16.  
 Report of Committee on Car Wheels of the Master Car Builders' Assoc.\* (15) June 16; (18) June 24.  
 Report of the Committee on Couplers of the Master Car Builders' Assoc.\* (15) June 16.

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- Report of Committee on Draft Gear of the Master Car Builders' Assoc.\* (15) June 16; (18) June 17.
- Lubricator for Locomotive Air Pumps.\* (15) June 16.
- Report of Committee on Loading Rules of the Master Car Builders' Assoc.\* (15) June 16.
- Single Grade-Crossing Elimination at Pittsburgh will Cost \$750 000.\* (14) June 17.
- Report of the Committee on Tank Cars of the Master Car Builders' Assoc.\* (15) June 17.
- Self-Clearing Triple Hopper Bottom Gondola Cars for the Erie Railroad.\* (18) June 17.
- Tie Cars for the Atchison, Topeka & Santa Fe Ry.\* (18) June 17.
- Electric Operation on the St. Paul.\* A. H. Armstrong. (17) June 17.
- Fox Type Pressed Steel Pedestal Trucks for Cars and Locomotive Tenders.\* (18) June 17.
- Electric Locomotive Maintenance on Pennsylvania Railroad.\* (17) June 17.
- Apprehension Regarding the National Electrical Safety Code. R. J. McClelland. (11) June 17.
- Fundamentals of Signaling, Automatic Block Signaling. Kenneth L. Van Auken. (18) June 17.
- New York Elevated Road's Attitude on Train Stops.\* (18) June 17.
- Specifications and Tests of Materials. (Report of Committee of the Master Car Builders' Assoc.) (15) June 17.
- As the Government Interprets Railroad Depreciation. (14) June 17.
- Welding of Cast-Steel Truck Side Frames and Bolsters. (Report of Committee of the Master Car Builders' Assoc.) (15) June 17.
- Tests of Passenger Car Radiators. A. J. Wood. (Paper read before the Master Mechanics' Assoc.) (15) June 20.
- Dimensions for Flange and Screw Couplings for Injectors. (Report of Committee of the Master Mechanics' Assoc.) (15) June 20.
- Report on Standardization of Screw Threads.\* F. O. Wells. (Paper read before the Master Mechanics' Assoc.) (15) June 20; (18) June 24.
- Revision of Standards and Recommended Practice.\* (Report of Committee of the Master Mechanics' Assoc.) (15) June 20; (18) June 24.
- Report of Committee on Mechanical Stokers of the Master Mechanics' Assoc. (15) June 20; (18) June 24.
- Alloy Steel in Locomotive Design. L. R. Pomeroy. (Paper read before the Master Mechanics' Assoc.) (15) June 21.
- Report on Equalization of Long Locomotives.\* Committee of the Master Mechanics' Assoc. (15) June 21.
- Design, Maintenance and Operation of Electric Rolling Stock.\* (Report of Committee of the Master Mechanics' Assoc.) (15) June 21.
- Design and Maintenance of Locomotive-Boilers. (Report of Committee of the Master Mechanics' Assoc.) (15) June 21; (18) June 24.
- Report on Fuel Economy and Smoke Prevention. (Report of Committee of the Master Mechanics' Assoc.) (15) June 21; (18) June 24.
- Report of Committee on Locomotive Headlights of the Master Mechanics' Assoc. (15) June 21.
- Report on Superheater Locomotives. Committee of the Master Mechanics' Assoc. (15) June 21; (18) June 24.
- Design and Materials for Pistons, Valves, Rings and Bushings.\* (Report of Committee of the Master Mechanics' Assoc.) (15) June 21.
- Modernizing of Existing Locomotives.\* (Report of Committee of the Master Mechanics' Assoc.) (15) June 22; (18) June 24.
- Use of Powdered Fuel in Locomotives. (Report of Committee of the Master Mechanics' Assoc.) (15) June 22; (18) June 24.
- Specifications and Tests of Materials.\* (Report of Committee of the Master Mechanics' Assoc.) (15) June 22.
- Costs to Build Spur Tracks. (13) June 22.
- Train Resistance and Tonnage Rating.\* (Report of Committee of the Master Mechanics' Assoc.) (15) June 22; (18) June 24.
- Snowsheds and Tunnels on the Great Northern Ry.\* (13) June 22.
- A New Connecting Link of the Burlington.\* (15) June 23.
- A Graphic Train Sheet. F. W. Rizer. (15) June 23.
- Well Car of 70 Tons Capacity.\* (15) June 23.
- Santa Fe Type Locomotives for the Texas & Pacific Ry.\* (18) June 24.
- A Model Hospital Train.\* Alfred Gradenwitz. (46) June 24.
- Car Wheel Flange Design.\* Geo. W. Lyndon. (Paper read before the Master Car Builders' Assoc.) (18) June 24.
- Automobile Cars for the Wheeling & Lake Erie R. R.\* (18) June 24.
- Railroad Fire-Fighting Apparatus Used in Canada.\* (46) June 24.
- Fuel Oil Installations and Equipment, Florida East Coast Ry.\* (18) June 24.
- Promotion of Fuel Economy on the Rock Island System.\* Carl Scholtz. (From the *Rock Island Employee's Magazine*.) (18) June 24.
- Rock Tunneling Without the Use of Explosives.\* (46) June 24.

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- Report of Committee on Draft Gear of the Master Car Builders' Assoc. (13) June 18.
- Indicator for Locomotive Air-Pumps. (13) June 18.
- Report of Committee on Location Rules of the Master Car Builders' Assoc. (13) June 18.
- Single Overhead Crossing Elimination at Pittsburgh with Cost \$150,000. (14) June 17.
- Report of the Committee on Tank Cars of the Master Car Builders' Assoc. (13) June 17.
- Self-Cleaning Triple Hopper Bottom Gondola Cars for the N.Y. Railroad. (13) June 17.
- The Cars for the Atlantic, Tobacco & Santa Fe R.R. (13) June 17.
- Electric Operation on the St. Paul. A. H. Armstrong. (17) June 17.
- For Two Tracked Steel Pivotal Trucks for Cars and Locomotive Tenders. (13) June 17.
- Electric Locomotive Maintenance on Pennsylvania Railroad. (17) June 17.
- Apparatus Regarding the National Electrical Safety Code. H. J. McGowan. (11) June 17.
- Fundamentals of Signaling. Automatic Block Signaling. Kenneth L. Van Allen. (12) June 17.
- New York Elevated Road's Attitude on Train Stops. (14) June 17.
- Specifications and Tests of Materials. (Report of Committee of the Master Car Builders' Assoc.) (13) June 17.
- As the Government Inspects Railroad Depositions. (14) June 17.
- Welding of Cast-Iron Truck Side Frames and Bolsters. (Report of Committee of the Master Car Builders' Assoc.) (15) June 17.
- Tests of Pennsylvania Car Builders. A. J. Wood. (Paper read before the Master Mechanics' Assoc.) (13) June 20.
- Dimensions for Flange and Boxer Couplings for Locomotives. (Report of Committee of the Master Mechanics' Assoc.) (13) June 20.
- Report on Standardization of Screw Threads. F. O. Wolff. (Paper read before the Master Mechanics' Assoc.) (13) June 20.
- Revision of Standards and Recommended Practices. (Report of Committee of the Master Mechanics' Assoc.) (13) June 20.
- Report of Committee on Mechanical Stops of the Master Mechanics' Assoc. (13) June 20.
- Alloy Steel in Locomotive Design. J. H. Pomroy. (Paper read before the Master Mechanics' Assoc.) (13) June 21.
- Report on Standardization of Locomotive Components. Committee of the Master Mechanics' Assoc. (13) June 21.
- Design, Maintenance and Operation of Electric Hoisting Block. (Report of Committee of the Master Mechanics' Assoc.) (13) June 21.
- Design and Maintenance of Locomotive Hoisting. (Report of Committee of the Master Mechanics' Assoc.) (13) June 21.
- Report on Fuel Economy and Smoke Prevention. (Report of Committee of the Master Mechanics' Assoc.) (13) June 21.
- Report of Committee on Locomotive Headlights of the Master Mechanics' Assoc. (13) June 21.
- Report on Superheated Locomotives. Committee of the Master Mechanics' Assoc. (13) June 21.
- Design and Materials for Piston Valves, Rings and Bushings. (Report of Committee of the Master Mechanics' Assoc.) (13) June 21.
- Modernization of Existing Locomotives. (Report of Committee of the Master Mechanics' Assoc.) (13) June 21.
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- Snowdrifts and Tunnels on the Great Northern Ry. (13) June 21.
- A New Connection Link of the Burlington. (13) June 21.
- A Triple Train Sheet. W. W. Hiver. (13) June 21.
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- Car Wheel Flange Design. Geo. W. Landon. (Paper read before the Master Car Builders' Assoc.) (13) June 21.
- Automatic Cars for the Western & Lake Erie R.R. (13) June 21.
- Railroad Time-Table Apparatus Used in Canada. (14) June 21.
- Fuel Oil Installation Apparatus. John Eastwood. (13) June 21.
- Promotion of Fuel Economy on the Rock Island System. Carl Scholtz. (From the Rock Island Engineer, December, 1915.) (13) June 21.
- Rock Tunneling Without the Use of Explosives. (14) June 21.

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- 64 793 Miles of Railroad now Covered by Government; Roadway Parties of Division of Valuation, Interstate Commerce Commission, Inventory 23 186 Miles in Six Months. (14) June 24.
- Four Engineering Innovations on the Magnolia Cutoff.\* Francis Lee Stuart. (13) June 29.
- Modern Superheater and Its Performance. S. S. Riegel. (Paper read before the Central Ry. Club.) (15) June 30; (25) July.
- Steam Railroad Statistics to June 30, 1915. (15) June 30.
- The Selection of Cross-Ties. (87) July.
- Empty and Load Brake Equipment.\* Walter V. Turner. (Abstract of paper read before the St. Louis Railroad Club.) (25) July.
- Rebuilding Small Passenger Stations.\* H. F. Haag. (18) July.
- A Locomotive Inspection System.\* N. M. Barker. (25) July.
- Flood Damage to Railroads in Iowa.\* (87) July.
- Steel Ore Cars.\* (25) July.
- Report on the Wreck at Bradford, R. I. (18) July 1.
- Equalization of Long Locomotives.\* (Report of Committee of the Am. Ry. Master Mechanics' Assoc.) (18) July 1.
- Why Electric Headlights Are Ordered by the Interstate Commerce Commission. (18) July 1.
- Electrification of an English Freight Line.\* (17) July 1.
- Electric Railways in Military Service. J. B. Bellinger. (Abstract of paper read before the New York Elec. Ry. Assoc.) (17) July 1.
- 185-Foot Fill of Bessemer & Lake Erie Railroad Reaches Beginning of Last Stage.\* (14) July 1.
- Electric Traction a Success on C., M. & St. P. Ry.\* (13) July 6.
- Operation of St. Paul Electrification.\* (15) July 7; (111) July 8.
- The Railways and the National Guard. Woodrow Wilson. (Letter to the Am. Ry. Assoc.) (15) July 7.
- Store Department Buildings (For Railroads).\* (Report of the Ry. Storekeepers' Assoc.) (18) July 8.
- Mallet Articulated Locomotives for the Baltimore & Ohio R. R.\* (18) July 8.
- What the Government Valuation Division is Doing and How the Work is Handled.\* C. W. Stark. (14) Serial beginning July 8.
- Developing Carload Freight Traffic on Illinois Traction System.\* (17) July 8.
- A Cast-Steel Wheel with Manganese Tread and Flange.\* (17) July 8.
- Foundation Resilience and Rail Corrugation.\* T. Norman Jones, Jr. (17) July 8.
- Platform Shelters of Concrete Unit Construction.\* (13) July 13.
- First Steel Coaches of the Boston & Maine.\* (15) July 14; (25) July.
- Grade Crossing Elimination in Camden, N. J.\* (15) July 14.
- New Automatic Block Signals on the Atlantic Coast Line.\* (15) July 14.
- Triplex Articulated Locomotives for the Erie.\* (15) July 14.
- Failure of Government Ownership in Canada. Samuel O. Dunn. (From *Journal of Political Economy*.) (15) Serial beginning July 14.
- Testing and Adjusting Track Scales by the Graphical Method.\* C. A. Briggs (Paper read before the National Scale Men's Assoc.) (18) July 15.
- A Rapid and Accurate Method of Cross-Sectioning Tunnels.\* T. H. Robertson. (18) July 15.
- Advances Allowed in Eastern Canadian Freight Rates. (18) July 15.
- Are Old Rails Worth Conserving. John Reinehr. (Paper read before the Ry. Storekeepers' Assoc.) (18) July 15; (87) July.
- Railroads Will Demand Central Station Energy.\* Frederic Nicholas. (27) July 15.
- St. Paul is Doing Intricate Track-Elevation Work in Chicago with Company Forces.\* (14) July 15.
- Hydraulic Excavation of a Large Cut in Cleveland, Ohio, Grade Crossing Elimination. C. E. Drayer. (86) July 19.
- Railway Improvements at Clinton, Iowa. (13) July 20.
- Railway Regulation Causes Locomotor Ataxia. Frank Trumbull. (Paper read before the National Hay Assoc.) (15) July 21.
- Lift Bridges at a Freight Platform.\* (15) July 21.
- Position Light Signals on the Pennsylvania. (15) July 21.
- Car for the Transportation of Live Fish.\* (15) July 21.
- Pacific Type Locomotives for the Reading.\* (15) July 21.
- L'Eclairage Electrique des Trains.\* (33) Feb. 12.
- L'Excavation du Tunnel du Mont Royal à Montréal (Canada).\* F. Hofer. (33) Apr. 29.
- Chariot-Transbordeur à Commande Hydro-Electrique de la Gare de Moor Street, à Birmingham (Angleterre).\* (33) May 6.
- L'Equippement des Lignes Aériennes Triphasées des Chemins de Fer Electriques Italiens.\* Carlo Maurillo Lerici. (33) May 13.
- L'Application de la Condensation sur les Locomotives à Vapeur.\* J. Carlier. (33) June 3.
- La Ligne de Jonction Athènes-Salonique entre Papapouli et Plati.\* (33) June 10.

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- 4172 Miles of Railroad now Covered by Government; Highway Part of 1917-18 Year of Valuation. Interstate Commerce Commission. Inventory 22186 Miles in Six Months. (14) June 24.
- Four Engineering Innovations on the Magnolia Canal. Francis Lee Stuart. (15) June 20.
- Modern Superheater and its Performance. R. E. Hixson. (Paper read before the Central Ry. Club.) (15) June 20; (25) July.
- Steam Railroad Statistics to June 30, 1912. (15) June 20.
- The Selection of Cross-Ties. (15) July.
- Empy and Load Brake Equipment. Walter V. Turner. (Abstract of paper read before the St. Louis Railroad Club.) (25) July.
- Handling Small Passenger Stations. H. M. Hawk. (18) July.
- A Locomotive Inspection System. N. M. Barker. (25) July.
- Food Damage to Railroads in Iowa. (27) July.
- Steel Ore Cars. (25) July.
- Report on the Work at Harbors. R. L. (15) July 1.
- Explanation of Long Locomotives. (Report of Committee of the Am. Ry. Master Mechanics Assoc.) (18) July 1.
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- Electrication of an English Freight Line. (17) July 1.
- Electric Railways in Military Service. A. D. Hollinger. (Abstract of paper read before the New York Ry. Assoc.) (17) July 1.
- 125-Foot Hill of Locomotive & Lake Erie Railroad Remains Beginning of Last Stage. (14) July 1.
- Electric Traction & Success on C. M. & St. M. Ry. (13) July 6.
- Operation of St. Paul Electric. (15) July 7; (11) July 8.
- The Railways and the National Guard. Woodrow Wilson. (Letter to the Am. Ry. Assoc.) (15) July 7.
- Store Investment Backlog (For Railroads). (Report of the Ry. Storekeepers' Assoc.) (18) July 8.
- After Artificially Locomotive for the Baltimore & Ohio R. R. (18) July 8.
- What the Government Aviation Division is Doing and How the Work is Handled. C. W. Starr. (14) Serial beginning July 8.
- Developing Central Electric Traction on Illinois. (17) July 8.
- A Car and Wheel with Manganese Tires and Rims. (17) July 8.
- Reconstruction of Concrete and Rail Construction. T. Norman Jones. (17) July 8.
- Platform Station of Concrete Rail Construction. (17) July 12.
- First Steel Carbody of the Boston & Maine. (15) July 14; (25) July.
- Grass Growing Experiment in Canada. N. J. (15) July 14.
- New Automatic Brake Systems on the Atlantic Coast Line. (15) July 14.
- Trailer Articulated Locomotives for the Erie. (15) July 14.
- Failure of Government Ownership in Canada. Samuel G. Dunn. (From Journal of Railway Economics.) (15) Serial beginning July 14.
- Testing and Adjusting Track Scales by the Graphical Method. C. A. Briggs. (Paper read before the National Scale Makers' Assoc.) (18) July 15.
- A Rapid and Accurate Method of Cross-Sectioning Tunnels. T. H. Robertson. (18) July 15.
- Advances Allowed in Eastern Canadian Freight Rates. (18) July 15.
- Are Old Rails Worth Conserving? John Reicher. (Paper read before the Ry. Storekeepers' Assoc.) (18) July 15; (27) July.
- Railroads With Demand Control Station Economy. Frederic Nicholas. (17) July 15.
- St. Paul is Doing Fastest Track-Recreation Work in Chicago with Company Forces. (14) July 15.
- Hydraulic Excavation of a Large Cut in Cleveland, Ohio, Grade Crossing Elimination. C. E. Dwyer. (18) July 15.
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- L'Excavation du Tunnel du Mont Royal à Montréal (Canada). E. Haber. (23) Apr. 20.
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- L'Équipement des Lignes Adhérentes Triphasées des For. Electriques Nationales. Carlo Mantilio Lardi. (23) May 12.
- L'Application de la Condensation aux Locomotives à Vapeur. J. Carlier. (23) June 3.
- La ligne de jonction Aléman-Saint-Jean-Papagouli et Plati. (15) June 10.

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- Chauffage au Poussier de Tourbe d'une, Locomotive à Marchandises de l'Etat suédois.\* (33) June 17.  
 Comparaison des Spécifications en Vigueur pour la Fourniture des Rails.\* A. Goupil. (33) July 1.  
 Neuere Studien über die Schwankungen des Kraftbedarfs der elektrischen Zugförderung.\* W. Kummer. (107) Serial beginning Apr. 22.  
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 Die Begrenzung des lichten Raumes und der Fahrzeuge der schweizer. Normal-spurbahnen.\* R. Winkler. (107) June 3.

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- The Construction of the Dorchester Tunnels Under Fort Point Channel.\* A. A. Cohill. (109) May.  
 Power Developments for Urban Transportation.\* Clifton W. Wilder. (9) May.  
 Rapid Transit Work in 1915, New York City.\* D. A. Sealey. (13) May 4.  
 Special Track Layouts Made Interchangeable.\* Burr S. Watters. (17) May 6.  
 Latest Connecticut City Cars.\* (17) May 6.  
 Rail Joints. R. H. Findley. (Paper read before the Iowa Gas, Electric Light, Street and Interurban Ry. Assoc.) (17) May 13.  
 The Building and Financing of Subways. (Paper read before the Am. Elec. Ry. Assoc.) (96) May 18.  
 One-Man, Light-Weight Cars. W. E. Moore. (Paper read before the Pennsylvania Street Ry. Assoc.) (17) May 20.  
 Des Moines Front and Center-Door Cars.\* (17) May 20.  
 Stepless Double-Deck Car Introduced in Vienna.\* Ludwig Spängler. (17) June 3.  
 Equipment Records on the Binghamton Railway.\* (17) June 3.  
 Some Problems of the Electric Railway Industry. F. W. Doolittle. (Paper read before the New England Street Ry. Club.) (17) June 3.  
 A Method of Excavating Deep Cuts to Neat Lines (in Subway Construction).\* (86) June 7.  
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 Energy Saved with Roller Bearings. H. A. Johnson. (Paper read before the Illinois Elec. Rys. Assoc.) (17) June 17.  
 Roller Bearings for Railway Use. Raymond H. Carhart. (Paper read before the Illinois Elec. Rys. Assoc.) (17) June 17.  
 New Route Signs for Denver.\* (17) June 17.  
 Storeroom Systems. A. Schwarz. (Abstract of paper read before the Central Elec. Ry. Accountants' Assoc.) (17) June 24.  
 Prospects Poor for Seattle Municipal Lines. (17) June 24.  
 Power Generation for Electric Railways.\* Henry G. Stott. (Abstract of paper read before the Am. Elec. Ry. Assoc.) (17) June 24.  
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 B. J. Arnold Reports on Bay State Street Railway.\* (17) July 1.  
 Investment per Revenue Passenger and Density of Traffic.\* D. J. McGrath. (17) July 8.  
 Electric-Welded Joints Installed at Low Cost (on Indianapolis Railways).\* R. J. Smith. (17) July 8.  
 Single-Truck, Arch-Roof Cars of the United Traction Company, Albany.\* (17) July 8.  
 Concreting Track in Fort Smith, Ark.\* (17) July 15.  
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 Reinforcing Tubular Poles Internally.\* L. L. Foster. (17) July 15.  
 Car-Lighting Improvements and Costs on the Los Angeles Railway.\* J. L. Clarke. (17) July 15.  
 Inexpensive Excavation by Cleveland Railway Co. (86) July 19.  
 Die elektrischen Stadtschnellbahnen der Vereinigten Staaten von Nordamerika. F. Musil. (102) Mar. 1.

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- Intensive Street Cleaning Methods.\* Richard T. Fox. (4) Mar.  
 The Extent to Which Sewage Can Be Purified by Practicable Methods of Artificial Treatment Now in Use. Harrison P. Eddy. (58) Apr.  
 The Duties of a Municipal Engineer and Surveyor in Connection with Factories and Workshops. Frederick Sadler. (114) No. 11, Apr.  
 Sewerage in the Doncaster Rural District.\* Walter R. Crabtree. (114) No. 12, Apr.  
 Sewage Treatment Plant.\* C. Arthur Poole. (60) May.

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- Handbook on Power for Traction, 2nd ed., International Association of Electricians, 1915, June 17. (33) June 17.
- Comparison des spécifications au Vieux pont à Pontreux des Hautes-Alpes. A. Gaspit. (34) July 1.
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- Der elektrische Betrieb und der Betrieb der Lokomotiven. H. Haeberle. (107) May 12.
- Die Bestimmung des elektrischen Betriebes und der Lokomotiven der elektrischen Normal-Spurbahn. R. Witten. (107) June 2.
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- The Construction of the Portland Tunnel Under Port Point Channel. A. A. Gough. (109) May.
- Power Development for Electric Transportation. Chilton W. Wilbur. 191 May.
- Light Traction Work in 1915. New York City. D. A. Roney. (12) May 4.
- Special Traction Layouts Made Interchangeable. R. E. Weller. (17) May 6.
- Latest Construction of Cars. (17) May 6.
- Roller Bearings. H. H. Fisher. (Paper read before the Iowa Gas Electric Light Street and Traction Assn.) (17) May 12.
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- Roller Bearings and Car Bodies. (17) May 25.
- Electric Double-Track Car Interchange in Vienna. Ludwig Hengstenberg. (17) June 2.
- Electricity in the Construction of the New York City Subway. (17) June 2.
- Some Problems of the Electric Railway Industry. M. W. Donnell. (Paper read before the New England Ry. Club.) (17) June 2.
- A Method of Increasing Deep Cuts in New Lines in Subway Construction. (80) June 7.
- Copper-Clad System Examined. Connecticut Commission on Street and Transportation. (17) June 10.
- Design and Construction of the Harlem River Post-Track Subway Tunnel. (80) June 14.
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- Roller Bearings for Electric Cars. Raymond H. Carhart. (Paper read before the Illinois Elec. Ry. Assn.) (17) June 17.
- New Electric System for London. (17) June 17.
- Streetcar System. A. Stewart. (Abstract of paper read before the Central Electric Ry. Association Assn.) (17) June 24.
- Proposed Plan for Electric Municipal Lines. (17) June 24.
- Power Generation for Electric Railways. Henry A. Bell. (Abstract of paper read before the Am. Elec. Ry. Assn.) (17) June 24.
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- Constructing Track in Port Smith, Ark. (17) July 15.
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- Improving Traction Power Interchange. J. L. Foster. (17) July 15.
- Car-Lighting Improvements and Gears on the Los Angeles Railway. J. L. Clarke. (17) July 15.
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- The electric streetcar system of the Vereinigten Staaten von Nordamerika. E. Maull. (102) Mar. 1.
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- The Duties of a Municipal Engineer and Surveyor in Connection with Sanitation and Sewerage. Frederick Badler. (114) No. 11 Apr.
- Sewerage in the Domestic Rural District. Walter R. Gaudin. (114) No. 12 Apr.
- Sewage Treatment Plant. C. Arthur Poole. (60) May.

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- Disposal of Municipal Refuse. Hiram Phillips. (115) May.  
 The Transmissibility of Diseases, and the Public Health. Alexander Crever Abbott. (3) May.  
 Results of First Year's Experiments with Small Sewage Treatment Plants by U. S. Public Health Service. Leslie C. Frank. (86) May 3.  
 Land Drainage Project in Northern Minnesota.\* (13) May 4.  
 Imhoff Tank and Dunbar Filters at Ennis, Tex.\* (13) May 4.  
 Reinsch-Wurl Sewage Screen, Long Beach, Calif.\* E. A. Rowe. (13) May 4.  
 Miners' Wash and Change Houses.\* Joseph H. White. (From *Technical Paper 116*, U. S. Bureau of Mines.) (57) May 5.  
 Warm Air Heating in a Northern City.\* (101) May 5.  
 Small Sewage Pumping Station for Park Site, Centrifugal Pumps, in Duplicate, Serve District of 2 000 Population in West Chester, Pa., Control is Automatic.\* W. De Witt Vosbury. (14) May 6.  
 Grease and Fertilizer Base from Boston Sewage. Robert Spurr Weston. (Abstract from *Journal*, Am. Public Health Assoc.) (13) May 11.  
 Steel Aqueduct for Sewer.\* (13) May 11.  
 Scarcity of Steel Results in Plain Concrete for Sewers.\* (13) May 11.  
 Torquay Medical and Swimming Baths.\* (104) May 12.  
 Furnace Installation Ordinance, Columbus, Ohio. (101) May 12.  
 Plumbing and Heating Details of Plunges.\* (101) May 12.  
 Electric Drive Replaces Steam for Drainage Pumps.\* E. J. Hegerty. (14) May 13.  
 Making Farm Drainage a Matter of Public Record.\* John W. Anderson. (Paper read before the Iowa Clay Products Mfrs.' Assoc.) (76) Serial beginning May 16.  
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 Corrugated Culvert Pipes Tested Under a Sand Bed.\* George L. Fowler. (17) May 20.  
 Sewage Screening and Sludge Burning Plant Prevent Sea Shore Nuisances at Long Beach, Cal.\* (14) May 20.  
 Experimental Studies of Strawboard Waste Purification. Harry B. Hommon. (Paper read before the Indiana San. and Water Supply Assoc.) (86) May 24.  
 Some Important Details of Land Drainage Work.\* (13) May 25.  
 Activated Sludge Experiments at Milwaukee. R. O. Wynne-Roberts. (96) May 25.  
 Schemes for Heating Small Assembly Hall.\* (101) May 26.  
 Sewage and Refuse Disposal at Malden and Coombe, Surrey. R. H. Jeffes. (Paper read before the Lower Thames Valley District Surveyors' Assoc.) (104) May 26.  
 The Typhoid Toll.\* George A. Johnson. (59) June.  
 The Latest Method of Sewage Treatment.\* Edward Bartow. (59) June.  
 Mosquito Extermination in Panama and New Jersey.\* Harold I. Eaton. (109) June.  
 Sewage Disposal by the Activated Sludge Process. T. Chalkley Hatton. (Abstract of paper read before the Ontario Health Officers' Assoc.) (96) June 1.  
 Traveling Sewage-Distributor Changes, Springfield, Mo.\* Alexander Potter. (13) June 1.  
 Modern Plumbing for the Country Home.\* A. H. D. (101) June 2.  
 Water Heater Systems.\* E. S. Stack. (24) June 5.  
 Storing and Pumping Sewage, Manchester, Mass.\* Charles W. Sherman. (13) June 8.  
 State-Wide Clean-Up of Labor Camps in California.\* J. J. Rosenthal. (13) June 8.  
 Plumbing Equipment in Country High School.\* (101) June 9.  
 Report of the Ventilation Research Committee of the Institution of Gas Engineers.\* (66) June 13.  
 Sewage Treatment Works for Cities on Boundary Waters. Earl B. Phelps. (86) June 14.  
 Sewage Treatment Study for Niagara Falls, Ontario.\* H. S. Phillips. (86) June 14.  
 Positive Fresh Warm-Air System for School.\* (101) June 16.  
 Hot Water System in a Small Farmhouse. Poarco. (101) June 16.  
 Conservation of Operating Head Controls Design of Oaklyn (N. J.) Sewage Plant.\* W. De Witt Vosbury. (14) June 17.  
 A New Dry-House. R. E. Tremoureaux. (103) June 17.

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- Purification of the Wastes from the Finishing of Woolen Goods. H. R. Croburst and A. D. Weston. (86) June 21.
- Windsor District Sewage Disposal.\* H. C. McRae. (Abstract from Report to the Inter. Joint Comm.) (96) June 22.
- Grit Chamber and Pump Station, Albany Sewage-Works.\* John H. Gregory. (13) Serial beginning June 22.
- Urgent Need of Public Comfort Stations. J. J. Cosgrove. (Paper read before the Eastern Supply Assoc.) (101) June 23.
- Equipment of Camps in Maine Woods.\* (101) June 23.
- Treharris Pit-Head Baths.\* (57) June 23.
- Six-Mile Sewer Extension Has Sinuous Course.\* (14) June 24.
- Mammoth Electric Draglines Dig Diversion Channels and Construct Levees.\* (14) June 24.
- The Proper Ratio of Economy Colls. Walter J. Kline. (Paper read before the National District Heating Assoc.) (64) June 27.
- Low Cost Comfort Stations in Indiana Parks.\* (101) June 30.
- Methods Adopted for Heating a Town.\* (101) Serial beginning June 30.
- Direct Heating in Store and Lodge Building.\* Charles L. Hubbard. (101) June 30.
- The Element of Chance in Sanitation.\* George C. Whipple. (3) July.
- Central Station Steam Heating by Miles City, Montana, Municipal Plant. G. C. Pruett. (60) July.
- Steam Requirements for Power and Heating. Charles L. Hubbard. (9) July.
- Modern Air Facts Relating to Air and Ventilation in Relation to Health. John F. Norton. (19) July 1.
- Sanitary Conveniences for Soldiers.\* (101) July 7.
- Installation of Driving Equipment for Fans. H. Bard. (101) July 7.
- Cleveland Street Railway Flushes City Streets; Car with 4 488-Gallon Tank Cleans 4 850 Feet of One Side of Street in 12 Minutes with One Filling of Tank.\* H. C. Ebeling. (14) July 8; (17) July 8.
- Misuse of Drainage Systems as Sanitary Sewers. Lafayette Higgins. (From the *Iowa Engineer*.) (19) July 8.
- Steel Wall Forms for Imhoff Tank Construction at Columbus Sewage Treatment Plant.\* (86) July 12.
- Final Report on Elmhurst Disposal Plant. (13) July 13.
- Amherstberg, Ont., Sewage Disposal. H. C. McRae. (Abstract from Report to the Inter. Joint Comm.) (96) July 13.
- Kansas Experience in Running Small Sewage Works. F. M. Veatch. (13) July 13.
- Sewage-Testing Station Report Limits Processes. (14) July 15.
- Gas Would Supply Temperature Necessary to Keep Air in Factories Ventilated by the Natural System, Within Permissible Limits. (24) July 17.
- Land Drainage Project in Florida. (86) July 19.
- Gantry Cranes Work on Sewer at Salt Lake City.\* (13) July 20.
- Air-Diffuser Experiences with Activated Sludge Tanks. (13) July 20.
- Vapor Heating Systems and Equipment.\* Charles A. Fuller. (101) Serial beginning July 21.
- Arbitration by Engineers Saves Time and Money in Sewer-Valuation Case. Farley Gannett. (14) July 22.
- Separate Sludge Digestion Improves Imhoff-Tank Operation by Keeping Sewage Fresh.\* Karl Imhoff. (14) July 22.
- La Construction et l'Organisation des Camps d'Internés belges en Hollande; Organisation de l'Enseignement dans ces Camps.\* C. Lemaire. (33) July 1.
- Die Sendrlic-Heiz- und Kühlapparate.\* M. Hottinger. (107) June 3.

**Structural.**

- Pit-Timber and Its Preservation. Percy Groom. (Paper read before the Midland Inst. of Min. Civ. and Mech. Engrs.) (106) Vol. 51, Pt. 2.
- The Web Strength of I-Beams and Girders.\* H. F. Moore. (4) Mar.
- Wire and Wire Rope.\* (98) Apr.
- Practical Applications of Statically Indeterminate Constructions.\* W. T. Hottappel. (2) Apr.
- New and Cheap Building Materials for Cottages. H. L. Paterson. (Paper read before the National Congress on Home Planning After the War.) (104) Apr. 28.
- The Mathematical Theory of the Elastic Arch. Willis Whited. (58) May.
- The Practical Chemistry and Modern Manufacture of Portland Cement. Geo. P. Diekmann. (55) May.
- Effect of Rust on the Rate of Corrosion. James Aston. (Paper read before the Am. Electro-Chemical Soc.) (62) May.
- Slide Rules for Reinforced Concrete Design.\* E. F. Rockwood. (109) May.
- On Deformation Limit of Plastic Materials, Limiting the Blame for Cracking and Fracturing of Steel Under Rolling and Forging, Showing the Mechanical Factors Concerned in the Disturbance of Steel Structures.\* (116) May.

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- Purification of the Wastes from the Finishing of Woolen Goods. H. R. Crookston and A. J. Weston. (80) June 17.  
 Wastewater Disposal. H. C. McKee. (Abstract from Report to the Inter. Joint Comm.) (90) June 22.  
 Gilt Chamber and Pump Station. Albert Sewage-Works. John H. Grogan. (13) Serial beginning June 22.  
 Liquid Wastes of Food. Condon Station. J. J. Condon. (Paper read before the Western Supply Assoc.) (101) June 22.  
 Equipment of Camps in Mobile Woods. (101) June 22.  
 Treatment of Camps in Mobile Woods. (101) June 22.  
 Six-Mile River Extension Has Numerous Curves. (14) June 24.  
 Municipal Sewerage Discharge Division Channels and Constructed Lanes. (14) June 24.  
 The Proper Ratio of Economy. Walter J. Kline. (Paper read before the National District Health Assoc.) (64) June 27.  
 Low Cost Control Station in Indiana Park. (101) June 30.  
 Methods Adopted for Heating a Town. (101) Serial beginning June 30.  
 Street Heating in State and Lodge Buildings. Charles L. Hubbard. (101) June 30.  
 The Heating of Chicago in Sanitation. George C. Whipple. (13) July.  
 Central Station Heating by Miles City. Montana. Municipal Plant. G. C. Whipple. (60) July.  
 Steam Heating for Power and Heating. Charles L. Hubbard. (9) July.  
 Modern Air Pumps Heating in Air and Ventilation in Heating. John W. Norman. (10) July.  
 Sanitary Conference for Soldiers. (101) July 7.  
 Installation of Drinking Dispenser for Food. H. Barb. (101) July 7.  
 Sewerage System. Kansas City. (101) July 7.  
 250 Feet of Sewer in 12 Minutes with One Pulling of Tank. (101) July 7.  
 H. C. McKee. (14) July 8.  
 Mine of Discharge Station in Sanitary Sewers. Lafayette Higgins. (From the Kansas Engineering.) (10) July 8.  
 Steel Wall Form for Liquid Tank Construction at Columbus Sewage Treatment Plant. (80) July 12.  
 Final Report on Elmhurst Disposal Plant. (13) July 13.  
 Amended. Oil. Sewage Disposal. H. C. McKee. (Abstract from Report to the Inter. Joint Comm.) (90) July 13.  
 Kansas Experience in Running Small Sewage Works. F. M. Ventch. (13) July 13.  
 Sewage-Testing Station Report Limits Processes. (14) July 13.  
 Gas Would Supply Temperature Necessary to Keep Air in Pockets Ventilated by the Natural System. William Permeable Limit. (14) July 17.  
 Land Drainage Project in Florida. (80) July 19.  
 Gravity Sewer Work on Sewer at Salt Lake City. (13) July 20.  
 Air-Discharge Experience with Activated Sludge Tanks. (13) July 20.  
 Vapor Heating Systems and Equipment. Charles A. Poller. (101) Serial beginning July 21.  
 Arbitration by Engineers Saves Time and Money in Sewer-Ventilation Case. Bailey Gannett. (14) July 22.  
 Separate Sludge Disposal Improves Inflow-Tank Operation by Keeping Sewage Fresh. (14) July 22.  
 In Connection with Construction of Camps of Interiors on Hollander. Organized. (14) July 22.  
 Station of the Construction of Camps of Interiors on Hollander. (14) July 22.  
 The Boulder-Hill and Knappton. M. Hollinger. (107) June 2.  
**Structural.**  
 Reinforced Concrete. Percy Groom. (Paper read before the Midland Inst. of Min. Civ. and Mech. Eng.) (100) Vol. 51, Pt. 2.  
 The Web Strength of I-Beams and Girders. H. F. Moore. (4) Mar.  
 The Web Strength of I-Beams and Girders. H. F. Moore. (4) Apr.  
 Practical Applications of Statistically Indeterminate Structures. W. T. Howell. (2) Apr.  
 New and Cheap Building Materials for Cottages. H. L. Peterson. (Paper read before the National Congress on Home Planning After the War.) (104) Apr. 28.  
 The Mathematical Theory of the Elasticity of Portland Cement. Geo. P. Williams. (28) May.  
 Effect of Heat on the Rate of Corrosion. James Aston. (Paper read before the Am. Electro-Chemical Soc.) (65) May.  
 Slide Rules for Reinforced Concrete Design. E. F. Rockwood. (100) May.  
 On Determination of Plastic Materials Limiting the Stress for Cracking and Fracturing of Steel Under Rolling and Torsion. Showing the Mechanical Factors Concerned in the Distribution of Steel Structures. (116) May.  
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**Structural—(Continued).**

- How to Select Industrial Steels. Arthur E. Paige. (9) May.  
 A Bargain in Homes. George W. Ritchie. (Paper read before the Am. Face Brick Assoc.) (76) May 2.  
 Heavy Concrete Beams Used in Rebuilding a Theater.\* Layton F. Smith. (13) May 4.  
 Piledriving Details on the Yolo Bypass Trestle.\* (13) May 4.  
 Cornice Runways for Swinging Scaffolds from Buildings.\* (13) May 4.  
 The Corrosion of Metals. William E. Gibbs, Richard H. Smith and Guy D. Bengough. (Report to the Institute of Metals.) (47) May 5.  
 Physical and Mechanical Factors in Corrosion. Cecil H. Desch. (Paper read before the Faraday Soc.) (19) May 6.  
 Warehouse Crane Runways Carried on Wall Brackets. New Orleans Cotton Buildings Designed with Reinforced Concrete Walls to Resist Heavy Lateral Pressure and Carry Crane Loads.\* (14) May 6.  
 Methods and Equipment Used in Constructing the Methodist Book Concern Building, Cincinnati, O.\* (86) May 10.  
 Discussion of Conductor Heads for Roof Drainage.\* Albert M. Wolf. (13) May 11.  
 Testing of Chains. G. S. Taylor. (Abstract.) (47) May 12.  
 Test of Mushroom Flat Slab in Seattle Warehouse Shows High Local Stress.\* D. E. Hooker. (14) May 13.  
 Riveted Joints Being Tested by Series of Simple and Accurate Mirror Extensometers.\* (14) May 13.  
 An Ideal Nest Built with Hollow Tile.\* (76) May 16.  
 Slag Portland Cement. B. J. Day. (Paper read before the Institution of Engrs. and Shipbuilders in Scotland.) (96) May 18.  
 Pressure of Wet Concrete on the Sides of Column Forms.\* A. B. McDaniel and N. B. Garver. (13) May 18.  
 Building Concrete Lighthouse on Brandywine Shoal.\* T. J. Rout. (13) May 18.  
 New Housing Development at Worcester.\* W. E. Freeland. (20) May 18.  
 Wood Sheet Piles Jetted into Hard Pan with 400 Pounds Pressure.\* K. D. MacLean. (14) May 20.  
 Methods Used in Re-Levelling a 200 000 Cu. Ft. Gas Holder. A. R. Schiller. (Paper read before the New England Assoc. of Gas Engrs.) (86) May 24.  
 Spacing of Shear Steel in Concrete Beams.\* Robert S. Beard. (13) May 25.  
 Coating Steel at Grand Central Terminal with Cement Gun.\* W. F. Jordan. (13) May 25.  
 How to Make Concrete Resist Action of Sea Water. W. Watters Pagon. (Abstract from *Journal*, Engrs. Club of Baltimore.) (14) May 27; (86) May 24.  
 Steel Skeleton of Bell Parkway Building Contains Heavy Portal Framing.\* (14) May 27.  
 Penetration of Preservatives. Lowrie Smith. (87) June.  
 Portland Cement.\* George A. Rankin. (3) June.  
 Building the Factory.\* John T. Klaber. (9) June.  
 The Yale Bowl.\* Thomas C. Atwood. (109) June.  
 The Painting of Iron and Steel.\* James Scott. (21) June.  
 Government Reports Elaborate Concrete Strength Data. (Abstract, *Technologic Paper No. 58*, U. S. Bureau of Standards.) (13) June 1.  
 Steel Castings and Physical Properties.\* Edwin F. Cone. (20) June 1.  
 The Relative Value of Different Fire Extinguishers.\* (12) June 2.  
 New Hospital for the Illinois Central R. R. at Chicago.\* (18) June 3.  
 New Trench-Excavation System.\* (13) June 8.  
 Strength of Burnettized Timber to be Studied.\* J. M. Barker. (13) June 8.  
 Two Buildings Carried Over a Railway Tunnel.\* (13) June 8.  
 Large Reinforced-Concrete Mat Building-Foundation. (13) June 8.  
 The Cement Gun.\* (11) June 9.  
 Simple Nickel Steels. Henry D. Hibbard. (From *Bulletin*, U. S. Bureau of Mines.) (47) Serial beginning June 9.  
 Heavy Vault Floor Framed into Existing Columns in Basement of Equitable Building.\* (14) June 10.  
 Modern Ideas on Fireproof Construction.\* S. M. Fechheimer. (82) June 10.  
 Compares Results of Tests on Three Types of Reinforced-Concrete Building Floors. D. E. Hooker. (Abstract of paper read before the Pacific Northwest Soc. of Engrs.) (14) June 10; (13) May 25.  
 Invar and Related Nickel Steels, Materials Having Peculiar Properties of Value for Scientific Instruments. (19) June 10.  
 The New Technology.\* (72) June 15.  
 Tests Show Earth Pressure One-Half Hydrostatic.\* (13) June 15.  
 Difficult Chimney Foundation Tested After Completion.\* (13) June 15.  
 Reinforced-Concrete Stairway for Hillside Footway.\* R. F. Odell. (13) June 15.  
 Lutes and Cements. S. S. Sadtler. (Abstract of paper read before the Am. Inst. of Chemical Engrs.) (47) June 16.

\* Illustrated.



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- The Critical Speeds of Shafts.\* W. M. Wallace. (12) Serial beginning June 16.  
 Swinging Cargo Hoist Beams.\* (14) June 17.  
 Artificial Seasoning of Timber. Ollison Craig. (Paper read before the Eng. Assoc. of the South.) (19) June 17.  
 Efficiency in Bridge and Building Work.\* (Report of Committee of the Am. Ry. Bridge and Bldg. Assoc.) (18) June 17.  
 Largest Panel-Testing Furnace in this Country Constructed at Washington.\* (14) June 17.  
 Test Compounds for Making Wood Fire Retardant. (14) June 17.  
 Mountain-Top Foundations Support Huge Telescope.\* (14) June 17.  
 How to Build a Hollow Tile Silo.\* (76) June 20.  
 Tremie Plant for Concreting Subaqueous Pedestals.\* Kirby Smith. (13) June 22.  
 Long-Span Howe Trusses Fail.\* (13) June 22.  
 Concrete Piles 100 Ft. Long.\* (Abstract from *Concrete and Constructional Engineering*.) (13) June 22.  
 Test of Adhesion of Face Tile to Concrete Backing.\* (13) June 22.  
 Bracket-Loads on Columns of Constant Cross-Section.\* William Dunn. (11) June 23.  
 Specifications Cover Grade A Office Building; New Requirements of National Fire Protection Association Compared with Those for Standard Building. (14) June 24.  
 One Thousand Steel Specifications Reviewed. R. Fleming. (14) June 24.  
 Engineers and Architects Want Branded Timber. Frank D. Chase. (14) June 24.  
 Diagrams for the Design of Reinforced Concrete T-Beams. M. A. Drucker. (86) June 28.  
 Concrete Plant Handled on Four Freight Cars.\* (13) June 29.  
 Malleable Iron, Its Characteristics, Uses and Abuses. Enrique Touceda. (Abstract of paper read before the Pittsburgh Ry. Club.) (47) June 30.  
 How Curing at Low Temperatures Affects Concrete.\* A. B. McDaniel. (67) July.  
 Grape-Vine Posts of Concrete.\* (67) July.  
 The Effect of Sulphur in Rivet Steel.\* J. S. Unger. (116) July.  
 1450-Ton Apartment House Moved 80 Feet on High Cribbing. (14) July 1.  
 Large Columns of Carbon and Alloy Steels Fail Near Yield Points of Material.\* J. H. Griffith and J. G. Bragg. (14) July 1.  
 The Rusting of Iron and Some Methods for Its Protection. (From *Motorschiff und Motorboot*.) (19) July 1.  
 Load Test of Concrete Floor Cracked by Settlement.\* J. H. Byrd. (13) July 6.  
 Japanning in Tumbling Barrels. T. P. Archer. (72) July 6.  
 Bond and Shear in Reinforced Footing Offsets.\* Clifford Older. (13) July 6.  
 Weak Retaining Wall Saved by Anchored Buttresses.\* (13) July 6.  
 Standard Test Specimens of Zinc-Bronze.\* C. P. Karr and H. S. Rawdon. (*Bulletin*, U. S. Bureau of Standards.) (47) July 7.  
 Concrete Floors in the Home. (19) July 8.  
 The Nation's Research Laboratory, How the Bureau of Standards Is Helping Us to Do Without Europe.\* (46) July 8.  
 Crystallization in Cold-Worked Steel.\* Ralph H. Sherry. (Abstract of paper read before the Soc. of Automobile Engrs.) (20) July 13.  
 Details of Roof-Arch Collapse in Atlanta.\* (13) July 13.  
 City Engineer Defines Quality of Lumber to Use. (14) July 15.  
 New Freezing and Thawing Apparatus Is Automatic. (14) July 15.  
 Test Concrete Cured Under Freezing Conditions.\* (14) July 15.  
 The New Cement Specifications, the Changes Made and the Reasons Therefor. R. J. Wig. (14) July 15.  
 Heavy Wire Rope Tested at Bureau of Standards.\* (14) July 15.  
 Excavation and Embankment Construction in Building the Yale Bowl. (86) July 19.  
 Largest Dredging Caisson Sunk as Building Foundation.\* (13) July 20.  
 Salvaging a Flooded Pumping Plant in California. Roy A. Silent. (13) July 20.  
 New Tests of Bolted Joints in Timber Framing.\* H. D. Dewell. (13) July 20.  
 Subway Columns and Girders Designed to Support Future High Office Building.\* (14) July 22.  
 Give Skin-Friction Data on Shaft Sinking in Chicago. (14) July 22.  
 Comfortable Houses Hold Men at Construction Camp.\* (14) July 22.  
 Largest Bridge Caissons Rivalled by Timber Crib Sunk in Free Air in 34 Days.\* (14) July 22.  
 Importance de l'Alésage des Trous de Rivets Dangereux Défaut de Certains Métaux. M. Mesnager. (43) July, 1914.  
 Les Arènes Athlétiques du Collège de New-York.\* (33) May 6.  
 Das Problem des Industriebaues.\* Bruno Bauer. (53) Serial beginning Apr. 14.  
 Die deutschen Vorschriften für Ausführung von Bauwerken aus Eisenbeton. (107) Apr. 22.

\* Illustrated.

## Structural—(Continued).

- The Critical Speeds of Beams. W. M. Wallace. (12) Serial beginning June 16. July 17.
- Swinging Cargo Hold Beams. (14) June 17.
- Artificial Seasoning of Timber. Oliver Craig. (Paper read before the Reg. Assoc. of the South.) (19) June 17.
- Emblems in Bridges and Building Work. Report of Committee of the Am. Ry. Bridges and Bldg. Assoc. (18) June 17.
- Largest Panel-Testing Machine in this Country Constructed at Washington. (14) June 17.
- Test Compendium for Making Wood Pile Retardant. (14) June 17.
- Mountain-Top Foundations Support Huge Telescope. (14) June 17.
- How to Build a Hollow Tile Sill. (75) June 20.
- Timber Plant for Covering Subaqueous Foundations. Kirby Smith. (17) June 22.
- Long-Span Howe Trusses Built. (17) June 22.
- Concrete Piles for Pile Barge. (Abstract from Concrete and Constructional Engineering.) (17) June 22.
- Test of Addition of Force Due to Concrete Hacking. (17) June 22.
- Bracker-Loads on Columns of Concrete Cross-Section. William Dunn. (11) June 22.
- Specifications Cover Grade A Office Building: New Requirements of National Fire Protection Association Compared with Those for Standard Building. (14) June 24.
- One Thousand Steel Specifications Reviewed. R. Fleming. (14) June 24.
- Engineers and Architects Want Handed Timber. Frank D. Chase. (14) June 24.
- Diagram for the Design of Reinforced Concrete T-Beams. M. A. Brueker. (80) June 22.
- Concrete Plant Handed on Four Freight Cars. (17) June 22.
- Malleable Iron, Its Characteristics, Uses and Abuse. R. H. T. Jones. (Abstract of paper read before the Pittsburgh Ry. Club.) (47) June 20.
- Flow Curve at Low Temperatures Affects Concrete. A. B. McDonald. (67) July.
- Group-Vinyls of Concrete. (67) July.
- The Effect of Sulphur in River Steel. J. S. Langer. (110) July.
- 1450-Ton Apartment House Moved 80 Feet on High Cribbing. (14) July.
- Large Columns of Carbon and Alloy Steels Fail Near Point of Material. J. H. Gilchrist and J. G. Brueker. (14) July.
- The Rating of Iron and Steel Methods for Its Protection. (From Westinghouse and Westinghouse.) (19) July.
- Load Test of Concrete Floor Checked by Settlement. J. H. Hyde. (17) July 6.
- Apparatus in Testing Concrete. T. P. Archer. (75) July 6.
- How and Steel in Reinforced Concrete. Gilbert Oliver. (17) July 6.
- Weak Reinforcing Walls Moved by Anchored Buttresses. (17) July 6.
- Standard Test Specimens of X-Ray-Exposed. G. M. Hart and H. E. Rawdon. (14) July 7.
- Concrete Floors in the Home. (19) July 7.
- The National Research Laboratory How the Bureau of Standards is Helping Us to the World's Progress. (48) July 7.
- Crystallization in Cold-Worked Steel. Ralph H. Sherry. (Abstract of paper read before the Soc. of Automobile Engineers.) (50) July 12.
- Details of Roof Arch Collapse in Atlanta. (17) July 12.
- City Engineer Begins Study of Timber to Use. (14) July 12.
- New Research and Testing Apparatus is Automatic. (14) July 12.
- Test Concrete Under Freezing Conditions. (14) July 12.
- The New Concrete Specifications: The Changes Made and the Reasons Therefor. R. J. Wile. (14) July 12.
- Heavy Wire Rope Tested at Bureau of Standards. (14) July 12.
- Excavation and Embankment Construction in Building the Yale Bowl. (80) July 12.
- Largest Overhead Crane Built as Building Foundation. (17) July 20.
- Salvaging a Flooded Pumping Plant in California. Roy A. Stiles. (17) July 20.
- New Tests of Bolted Joints in Timber Framing. H. D. Dwyer. (17) July 20.
- Subway Columns and Girders Designed to Support Future High Office Building. (14) July 22.
- Give Skin-Tension Data on Shell Sinking in Chicago. (14) July 22.
- Comfortable Houses Hold Men at Construction Camp. (14) July 22.
- Largest Bridge Girders Riveted by Timber Crib Sink in Free Air in 24 Days. (14) July 22.
- Importance of the Lamination of the Rivets. (14) July 22.
- M. Messinger. (47) July 22.
- Les Ateliers d'Aluminium du Collège de New-York. (37) May 6.
- Das Problem der Industriellen. Bruno Bauer. (37) Serial beginning Apr. 14.
- Die deutschen Vorschriften für Ausführung von Bauwerken aus Eisenbeton. (107) Apr. 22.



**Topographical.**

- Construction of an Unusual Relief Map for Los Angeles Aqueduct.\* Burt C. Heinly. (86) May 24.  
 The Mathematics of Vertical Curves. Leonard C. Jordon. (86) June 7.  
 Autographic Cross-Sectioning by a New Instrument.\* John Airey. (13) June 8.  
 Ingenious Special Devices for Tunnel Surveys.\* (13) June 15.  
 Precise-Level Survey of the City of Portland, Ore.\* W. P. Hardesty. (13) July 13.  
 Instrument Plots Profiles of River and Harbor Beds.\* (14) July 22.  
 Surveying 1 000 Square Miles with the Camera.\* (14) July 22.

**Water Supply.**

- Improvements in the Art of Mechanical Filtration.\* Thos. Fleming, Jr. (58) Jan.  
 Red Water and Suggested Remedies. Nicholas S. Hill, Jr. (8) Apr.  
 Water-Pressure Regulating Apparatus.\* (11) Apr. 28.  
 The Solid Piston Humphrey Pump.\* (12) Apr. 28.  
 Water Rights as a Liability. (From Report of R. R. Comm. of California.) (111) Apr. 29.  
 The Design and Test of a Large Reclamation Pumping Plant.\* G. C. Noble. (55) May.  
 The Evolution of Low Lift Pumping Plants in the Gulf Coast Country.\* W. B. Gregory. (55) May.  
 The Waldeck Reservoir in Germany.\* Kenneth C. Grant. (98) May.  
 Relation of Water Power to Transportation. Lewis B. Stillwell. (42) May.  
 Prevention of Corrosion in Pipe. F. N. Speller. (Paper read before the Am. Soc. of Heating and Ventilating Engrs.) (25) May.  
 Water Power Development and the Food Problem. Allerton S. Cushman. (42) May.  
 Water Power and Defense. W. R. Whitney. (42) May.  
 Electrochemical Industries and Their Interest in the Development of Water Powers. Lawrence Addicks. (42) May.  
 The Water Power Situation, Including Its Financial Aspect. Gano Dunn. (42) May.  
 Winter Operation of Water Works at Miles City, Montana. G. C. Pruett. (60) May; (86) May 10.  
 The Reconstruction of the Municipal Water Works, Cambridge, Ohio. W. J. Sherman, M. Am. Soc. C. E. (109) May.  
 The Arrowrock Dam. H. A. Lawson. (115) May.  
 The Power Development. I. R. Edwards. (Paper read before the Am. Electrochemical Soc.) (105) May 1.  
 Self-Cleaning Flume Screen.\* (13) May 4.  
 Water-Supply of 500 000 Gal. Daily from River Springs.\* (13) May 4.  
 Excavation for the Baldwin Reservoir, Cleveland.\* (13) May 4.  
 Deep Bore-Wells for Public Water Supply Purposes.\* W. H. Maxwell. (12) May 5.  
 British Columbia Mining Hydro-Electric Plants.\* Frank C. Perkins. (82) May 6.  
 Huge Circular Reservoir in Dubuque Protects Congested-Value Business District.\* Dabney H. Maury. (14) May 6.  
 The Medlow Dam.\* Percy Allan. (From the *Commonwealth Engineer*.) (111) May 6.  
 Filtration of Softened Water. F. F. Vater. (64) May 9.  
 Measuring the Water Used in Power-Plant Tests.\* Charles G. Richardson. (64) May 9.  
 Experience in the Chlorination of Milwaukee's Water Supply.\* H. P. Bohmann. (86) May 10.  
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